PLATE I.

(FRONTISPIECE.)



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ÆRIAL VIEW OF THE CRATER, ADEN.

A MEDICAL SURVEY OF ADEN 1933

BY

LIEUT.-COLONEL E. SELBY PHIPSON,
D.S.O., M.D. (Lond.), M.R.C.P. (Lond.), D.P.H., D.T.M. & H.,
INDIAN MEDICAL SERVICE,
Civil Administrative Medical Officer, Aden,
Health Officer of the Port, Aden,
and
Medical Officer in Charge
European General Hospital, Aden.

Aden:
COWASJEE DINSHAW & BROS.' PRESS,
1934.

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By kind permission of the Officer Commanding British Forces, Aden.

FOREWORD

BY

Lieut.-Colonel B R. Reilly, C.I.E., O.B.E.,

Chief Commissioner, Resident and Commander-in-Chief, Aden.

Colonel Phipson's admirable survey of medical work and administration in Aden provides a most valuable contribution to the knowledge of those who are interested in the problems of health and sanitation presented in this small but important Settlement. He has made a comprehensive review of the various branches of medical activity in Aden, a task for which he is peculiarly well fitted by his ten years' service here as Port Health Officer, and—since 1928—as Civil Administrative Medical Officer. Thanks to the co-operation of the Government of India, the local Settlement authorities and the Prince of Wales's Aden Nursing Association, considerable progress has been made in the interests of public health in recent years, notably in improvements in sanitation, in the appointment of a highly qualified Public Health Officer, in the provision of nursing in the Civil Hospital and in the improvement and extension of the buildings in which that institution is housed. Much still remains to be done, and Colonel Phipson's book indicates both the objects at which local medical administration must aim, and the nature of the difficulties that need to be overcome.

Aden is indebted to Colonel Phipson for his clear understanding of its medical problems and his work in dealing with them. He has now provided in his survey a complete picture of past developments and of the present position, which forms a most useful guide to those who will carry on this vitally important work in the future.

PREFATORY NOTE.

The recent issue of a *communiqué* by the Government of India, foreshadowing the final separation of Aden from India after nearly a century of Indian administration, coincident with the completion by the writer of ten years' continuous service in Aden, has inclined him to believe that a useful purpose will be served by the preparation of a Survey of contemporary medical work in Aden.

This Survey aims at presenting, in a readable form and with the minimum of statistical detail, an account of the present state of civil medical affairs in Aden, and of their development in the last decade, during which period the writer has had an opportunity of making a close study of the whole gamut of medical questions in Aden. The Survey also seeks to collate and to some extent to codify, though without any formal authority, some of the various usages and procedures which have been found appropriate to the particular circumstances of Aden, and to discuss, where discussion seems likely to be useful, those points of medical policy which are the fruit of local experience.

Finally, the Survey aspires to the position of a small work of reference for the use of anyone whose duty or inclination leads him to the study of the medical problems of a unique corner of the Empire, and, without any pretence to minute accuracy or to encyclopædic detail, to present in a connected and sufficiently circumstantial form, an account of the Medical Administration of Aden.

ACKNOWLEDGEMENTS.

The preparation of a Survey of this character is necessarily to some extent a compilation I am indebted, in its preparation, to Mr Geo. Henderson, Water and Drainage Engineer to the Aden Settlement, who wrote the substance of the Section on his special subjects, and to Lieut.-Colonel D. S. Johnston, C.I.E., R.E., Chairman Aden Settlement, who kindly revised it; to Dr. N. M. Hodivala, M.B., B.S., D.P.H., D.T.M., Medical Officer of Health, Aden Settlement, and Mr. F M. Mehta, Sanitary Superintendent, who prepared the material from which the Section on Urban Hygiene and Sanitation is largely built, and to Dr D. D Variava, M B., B.S., F.R.C.S., (Ed.), Civil Surgeon, Aden, and Miss E H. Brooks, M.B., B.S., M.R.C.S., L R.C.P., who gave me valuable help in the preparation of the Section dealing with the Civil Hospital and with Medical Work among Women respectively. The Geographical and Historical Section is partly based on the relevant article in Volume IV. of the Imperial Gazetteer of India, and the sub-section on Plague is similarly founded in part on a Joint Report by the writer in collaboration with Dr. D. G. Chitre, of Haffkine Institute, Bombay, on "The Plague Epidemic of 1928 as it affected the Port and Settlement of Aden," published in 1930 by the Government of Bombay In the sub-section dealing with small-pox I have drawn freely on a report by Major (now Lieut.-Colonel) C. L. Bilderbeck, M.A., M.B., D.P.H., I.M.S., who was officiating as Port Health Officer, Aden, in 1929. Lastly, I am indebted to Lieut.-Colonel H M. Wightwick, of the Indian Political Department, whose unique knowledge and experience of the malarial problems of Sheikh Othman were of great assistance in the presentation of the subject of Malaria in Aden.

ADEN,
April 1934.

E. S. P.

SECTION I.

GEOGRAPHICAL AND HISTORICAL.

The Fortress of Aden is situated on a peninsula about 12° north of the Equator and 45° east of Greenwich, on the south coast of the ancient province of the Yemen, Arabia. The inhabited peninsula is roughly oval, with a diameter of three to five miles, connected with the continent by a narrow neck of land some three miles long. Aden consists of a huge crater, walled round by precipices, the highest peak being 1775 feet above the sea. A great gap in the circumference of the crater has been rent on its sea face by some later volcanic disturbance, and on this aspect, the bed of the crater, but little above the sea level, slopes gently to the sea.

The main town of Aden, with some thirty thousand inhabitants, lies in this crater, almost surrounded by precipitous volcanic hills. On the opposite side of the main peak, known to mariners as "Shum-shum," is situated Tawahi, and the modern shipping and residential quarter, Steamer Point, which skirts part of the fine natural harbour of Aden.

The climate of Aden is trying for many months of the year, particularly in the lulls between monsoons in May and September. The mean shade temperature is roughly 90° F. in summer months and 75° F. in the winter months, but at certain periods of the year the atmostpheric humidity is high, and at these times the climate is very oppressive. The rain-fall is scanty and has an irregular annual average of about three inches. In spite of many discomforts of life in Aden, it is by no means unhealthy but prolonged residence without adequate leave-periods causes inevitable deterioration in health. Malaria is now practically non-existent, though constant vigilance is required to keep it so. Mosquito-breeding is kept down to so low a level by the natural aridity of the peninsula and by municipal and other measures that the use of mosquito nets by night is unnecessary, which adds greatly to personal comfort in the hot weather.

The Protectorate of Aden, as distinct from the Fortress and the suburb of Shaikh Othman, embraces a large tract of territory some forty-two thousand square miles in area, forming a maritime belt extending for some hundreds of miles along the southern coast of Arabia; it includes a number of states of local Arab sultans and chiefs in treaty-relations with the British Government, the rest of the territory being occupied by various semi-nomadic tribes, subservient to one or other of the Arab chiefs and under British protection. North of the Protectorate lies the territory of the Yemen proper,

ruled by an Arab chief, the Imam of San'a, who owes allegiance to no one, and his territory is perhaps unique in being completely immune from "spheres of influence," mandates or other forms of external political control, or even, until quite recently, formal diplomatic contact, although abutting on one of the main lines of maritime commerce.

Historically, Aden is of great antiquity. Aden formed part of the Yemen under the ancient Himyarite kings. It has been identified with the Eden of Ezekiel XXVII 23,–the Eden whose merchants traded "in all sorts of things; in blue cloths and broidered work; in chests of rich apparel, bound with cords and made of cedar." In the first few centuries of the Christian era, Aden was an important *entrepot* of trade between provinces of the Roman Empire and the East, and later for many centuries it flourished under Islamic rule from the sixteenth century onwards the rulers of Aden were at times the Turks and at times local Arab chieftains, and its importance gradually diminished In 1839 it was captured by the British under Captain Haines, and has since remained under British rule, until recently as a detached part of the Presidency of Bombay, fourteen hundred miles away to the north-east. Since that time, Aden has regained and no doubt surpassed its former glories, and is once again an important centre of transit trade, and still more important as a strategic point, as a coaling port and latterly, as an oil-bunkering port the oil being brought to Aden from Abadan in the Persian Gulf, by sea.

SECTION II.

THE ORGANISATION OF MEDICAL RELIEF IN ADEN

The decade 1923–1933 has seen many changes in Aden, and the latest and greatest is now looming on the horizon. During this period, which has witnessed the inception and development of many public enterprises of the first importance, the electricity undertaking, the piped water supply, main drainage and extensive sanitary improvements, the heads of the Civil Administration of Aden have been successively Lieut General Sir Thomas Scott, K.C.B., C.I.E., D.S.O., Major-General Sir Keith Stewart, K.C.B., D.S.O., Lieut.-Colonel Sir Stewart Symes, K.C.M.G., K.B.E., D.S.O., and Lieut.-Colonel B. R. Reilly, C.I.E., O.B.E. Of these officers, the first two, and their predecessors in office, combined in their appointment the military command as well as the control of the civil administraion. In 1927, however there were extensive changes in the administration of Aden as a result of which the military garrison was reduced by two regiments, and their place taken by an increased strength of Royal Air Force personnel, and the Army command replaced by a Royal Air Force command, with a Royal Air Force officer of the rank of Group Captain at its head. At the same time, the control of the civil administration, the head of which was formerly styled "General Officer Commanding and Resident" was vested in the first incumbent of a new appointment styled "Resident and Commander-in-Chief." The senior Medical Officer of the Station had previously similar dual functions. He was styled "Assistant Director of Medical Services, Aden Brigade and Civil Administrative Medical Officer."

On the separation of the civil administration from the military command, the military medical administration of Aden was vested in the Principal Medical Officer, Aden Command (Royal Air Force), and the civil medical administrative duties devolved on the senior of the two Indian Medical Service Officers in the station who held the posts, respectively, of Civil Surgeon, Aden, and Port Health Officer.

It will be understood that under the former system, which had been current for many years, the duties of Civil Administrative Medical Officer was held, as a collateral charge, by the Assistant Director of Medical Services, Aden Brigade, who rarely possessed any practical experience of civil [illegible] his civil functions naturally tended to be [illegible] duties, with the result that for many ye[illegible]istrative Medical Officer was little more than a post office.

In 1929, Sir Stewart Symes, the then Resident, was so impressed by the lax state of civil medical administration in Aden and the unsatisfactory standard of the Civil Hospital and other departments of medical activity, that he expressed his views on these defects, and detailed the remedies he proposed for them, in a despatch to the Government of Bombay. This was a remarkable document; its subject matter was represented with such vigour, such lucidity and such comprehensiveness that it constitutes a definite land-mark in medical progress in Aden. For the purpose of this Survey, it is necessary to review some of the matters dealt with by Sir Stewart Symes as they have a very definite bearing on the present medical organisation in Aden. Among the points considered were:

(a) *Co-relation.*

There should be as little over-lapping and as little waste as possible consequent on the separation of the civil and military medical control. An example of this co-relation is the arrangement by which certain non-European sick personnel forming part of the military organisation (Aden Protectorate Levies) should be, and now actually are, accommodated on a repayment basis in the Civil Hospital, thus avoiding the heavy expense of maintaining a separate military hospital or ward for non-European military personnel. An example of the converse arrangement is that by which all civil requirements in the direction of bacteriological work, X-ray work, and electro-therapy are met, on a similar basis of repayment, by the Royal Air Force medical organisation which is specially equipped for such work.

(b) *Control.*

to his personal responsibility or emoluments, to divide his time more equally in the discharge of his dual *rôle*". It was emphasised that without more direct personal control, and supervision of local medical and health services, there could be no assurance that expenditure on these services from public and private funds was being spent to the best advantage, and that the success of attempts to raise the health and hygienic standards of the community depended very largely on personal control.

The duties of Civil Administrative Medical Officer have since been defined by the Government of India on lines suggested by the Resident. They are:

i He will act as adviser to the Resident on all civil matters having a medical and public health bearing, relating to the Aden Settlement, Aden Protectorate, Perim and Kamaran.

ii He will be the administrative head, under the Resident, of all Government and State-aided medical institutions in the Settlement, and all correspondence, reports and returns between subordinate medical offices and the Residency office will pass through the office of the Civil Administrative Medical Officer.

iii He will, by visits and inspections as frequent as his other duties will permit, keep in constant touch with all medical and public health activities in the Settlement; co-ordinate these activities so that public monies, medical personnel and Government material are utilised to the best advantage, and satisfy himself that reciprocal arrangements with the Royal Air Force medical organisation are working smoothly.

iv He will exercise the same control over the Health Officer (now called the Medical Officer of Health) as that exercised by the Director of Public Health in the (Bombay) Presidency in sanitary matters. When there is a difference of opinion between the Settlement Committee and the Medical Officer of Health with regard to the administration of public health and other technical matters, the matter would be referred to the Civil Administrative Medical Officer for decision.

v He will, in general, exercise such powers, administrative and disciplinary, as are customarily vested in a Civil Administrative Medical Officer.

The duties and responsibilities detailed above have been, as previously stated, assumed by the Civil Administrative Medical

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Officer, but the Resident's parallel proposals for providing him with means for efficiently carrying them out, such as the increase of subordinate staff, estimated to cost Rs. 6,500 annually, have been shelved indefinitely owing to prevailing financial strigency. The Civil Administrative Medical Officer is accordingly working under a disadvantage, and the present position in this respect cannot be regarded as satisfactory.

(c) *Hospitals.*

Sir Stewart Symes was very unfavourably impressed by the standard of accommodation and the care of patients at the Civil Hospital, and he perceived that extensive additions and alterations to the building would be necessary before it could be made into a creditable institution. There was some doubt whether the Hospital on its present site in the centre of the town should be abandoned, and rebuilt on some other site to be determined on, or whether the necessary improvements and additions to the Hospital should be effected on the existing site. After a careful enquiry by the committee appointed for the purpose, it was unanimously recommended to improve and add to the existing Hospital, a recommendation which was accepted by the Resident. A scheme of alterations and improvements was drawn up, which received the sanction of the Government, and the scheme has now been nearly completed at a cost of Rs. 84,000.

(d) *Preventive Service.*

The lack of that organised preventive effort connoted by the various activities of a modern Public Health Department, had not escaped the attention of Sir Stewart Symes. At that time the Settlement Sanitary Department—it could not be called a Public Health Department—was under the charge of a trained Sanitary Superintendent, whose duties, within the scope assigned to him and within the compass of his attainments, were very efficiently carried out; but he was naturally unable to deal with the higher ranges of public health work for which a specially-trained medical man is required. The Aden Settlement Committee having had, some years previously, an unfortunate experience in the selection of a Medical Officer of Health it had abandoned the idea of making further efforts to find a suitable man, and had allowed the Sanitary Department to relapse to its former status, in which the principal goal of its sanitary activities was a high degree of efficiency in such matters as conservancy, cleanliness of streets and sweeper passages, and similar necessities of communal existence

As a result of representations made by the Resident, the Executive Committee of the Aden Settlement selected and appointed

in 1930 a highly-trained Indian Medical Officer of Health with British qualifications, and since his appointment the sanitary department of the Settlement, now appropriately named the Public Health Department, is going far to make up the leeway which was the result of many years of inertia. Its various activities are described later in Section X.

The writer has discussed the dispatch alluded to above in some detail because of its importance in supplying a much-needed impetus to medical progress in Aden, and because the proposals made in it have been so effectively espoused and supported by the present Chief Commissioner, Lieut.-Colonel B. R. Reilly, that in almost all instances they are now accomplished facts, and their bearing on the general organisation of medical relief in Aden will become evident in the pages which follow.

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SECTION III.

HOSPITALS.

Government: Civil Hospital, Crater; Principal Diseases; Medical Work Among Women. European General Hospital, Steamer Point. *Private:* Keith Falconer Mission Hospital, Shaikh Othman.

The Civil Hospital, Crater.

The Civil Hospital, built in 1861–63 is situated in the Crater on rising ground forming a salient from the hillside into the south-west part of the town of Aden, from which it is easily accessible on three sides. It originally consisted of two wards only: since then other wards have been added and at present it comprises several buildings with accommodation for one hundred and twenty-eight cases, and when the maternity and tuberculosis wards which are now under construction are completed, the total accommodation will be for one hundred and fifty-two patients.

Certain disadvantages are inseparable from the nature of its surroundings—noise, flies and dust. Flies and dust are a nuisance throughout the town at certain times of the year, but the accessibility of the Hospital to the general mass of the population of the town more than counter-balances these disadvantages of a central position.

In 1929 a committee was appointed by Sir Stewart Symes, the then Resident and Commander-in-Chief, to enquire into and report on the proposal to remove the Civil Hospital from its present premises to the recently abandoned British Infantry Barracks on the sea-front. The committee after careful enquiry decided not to recommend such a change, mainly for two reasons, that, apart from the Jewish element, the great majority of the local inhabitants, Arabs, Somalis, Hindus and Indian Mohammedans were opposed to the change and that the advantages to be gained by the change of site would not be commensurate with the very heavy anticipated expenditure. Sir Stewart Symes, having accepted the recommendation of this committee to leave the Hospital in its present situation, appointed another committee to enquire and report what renovations, structural alterations and additions to the hospital premises were necessary to put the hospital in a position to supply the requirements of all classes of the non-European resident population in the Aden Settlement and of patients from the interior, and to improve the general standard of its accommodation. This committee suggested

PLATE II.

(TO ILLUSTRATE SECTION III)

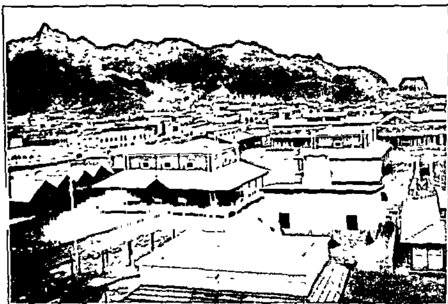


Photo Fernandez, Aden

CIVIL HOSPITAL, ADEN:

General View from above.

extensive improvements, consisting of fifteen items for new buildings and five involving repairs or minor alterations to existing buildings. The scheme was sanctioned in its entirety by the Government of India and most of the works proposed by the committee have since been carried out, and it is probable that next year will witness the completion of the whole scheme.

The hospital follows an "open door" policy, admitting non-European patients whatever their religion or nationality, and no discrimination is made between British subjects and patients of alien nationality. The hospital is maintained entirely by grants received from the Indian Government and the Colonial Office, the income from paying-patients' fees being negligible, and the total annual recurring expenditure is on an average, Rs. 50,000.

There is a special female ward with twenty beds served entirely by a female staff and so built as to suit, as far as is possible in a general hospital, the susceptibilities of orthodox Mohammedans. A special ward was built by the late Mr. Menahem Messa, a wealthy Jewish merchant of the town, solely for Jews; it has accommodation for six males and six females and was built in 1897 at the cost of Rs. 10,000, and all the patients admitted into the Jewish ward are dieted and clothed at the expense of Mr. Menahem Messa's heirs. For patients of the well-to-do classes there is a special block containing accommodation for seven patients, where each patient is given a separate room on payment of a nominal charge varying from Re. 1 to Rs. 5 per day, according to the means of the patient. This block occupies a very favoured position in the hospital grounds. There is also under the control of the institution a mental block with accommodation for six patients which will soon be increased to ten. Mental patients are detained here under observation and if certified insane they are either handed over to their relations, if they are willing to hold themselves responsible for their care, or they are transferred to the Mental Hospital, Thana, Bombay Presidency, irrespective of their nationality or place of origin. The responsibility for these cases being only rarely assumed by relatives, Arabs and Jews have occasionally to be transferred to the Mental Hospital in India; this is hardly a satisfactory arrangement, but owing to the fact that the accommodation in the mental block is very limited the patients cannot remain there, and no alternative has yet been devised. Incidentally it may be mentioned that it costs about Rs 800 to transfer a mental case from Aden to India.

The senior staff of the Civil Hospital consists of the Civil Surgeon, Aden, who is *ex-officio* Medical Superintendent of the Hospital, Dr. D. D. Variava, M.B., B.S., F.R.C.S., (Ed.), an officer of the Bombay Medical Service, a Lady Doctor, Miss E. H. Brooks, M.B., B S, M.R.C.S., L.R.C.P., four Subordinate Medical Service Off...

and a nursing staff consisting of the sister-in-charge, Miss D. K. Morton, a nurse-midwife, Miss I. R. Emmett, and a probationer nurse.

Many important improvements have been made in the Hospital during the last three years. All the alterations and additions suggested by the committee referred to above are now either completed or nearing completion. A separate ward, carefully screened by lattice work, has been constructed for female patients; police and military patients have been provided with a separate block to themselves. New quarters have been built outside the hospital for the subordinate medical staff, for the inferior establishment and for the sweepers. The Maternity block and Tuberculosis ward are under construction and will be ready for occupation early in 1934.

The military patients admitted to the Hospital belong to the Aden Protectorate Levies, who are Arabs recruited from the interior. According to an arrangement made with the Officer Commanding British Forces in Aden, the Civil Hospital undertakes to allot a maximum of fifteen beds for military patients who are admitted at a fixed charge of Rs. 4 per diem per patient, paid from Air Ministry funds.

The paying patients' wards which previously consisted of three small ill-ventilated rooms in the administrative block now occupy the finest building in the Hospital. The wards have not so far proved very popular with the better class of local inhabitants owing to the fact that under existing hospital arrangements it is not possible for relations of the patients to remain during the period of their stay in hospital. To meet this very general desire it has been proposed to provide a few small separate "family" wards consisting of at least two rooms with a verandah in front and a court-yard, bathroom, kitchen and latrine in the rear. There are many well-educated Arabs and Indians who would not consent to in-patient treatment except on these terms. This requirement promises to be met as regards the resident Arab population. A proposal has recently been made by Khan Bahadur M. A. K. Mackawee, a public-spirited citizen of Aden, to erect at his own expense a group of five family wards providing the accommodation referred to above. This generous offer has been gratefully accepted by the Settlement Committee who have agreed to provide a free site adjacent to the Civil Hospital building and to maintain the wards after completion. The wards will be known as the "Mackawee Arab Family Wards" and they should be of great value to the section of the population for whose use they are intended.

Nursing Arrangements.

Previously to 1928, the female staff consisted of two ayahs only and the male staff used to attend to the female wards. The first

PLATE III.

(TO ILLUSTRATE SECTION III.)

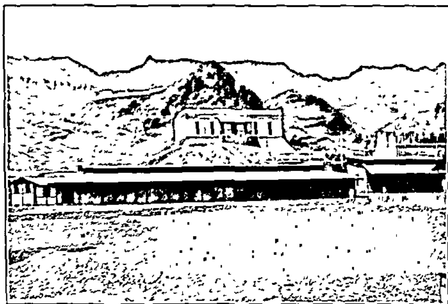


Photo Coutinho, Aden

CIVIL HOSPITAL, ADEN:
View of Private Patients' Ward (above) and *Purdah* Ward (below).

nurse was appointed in 1928, and she was expected to look after the whole hospital in addition to attending midwifery cases in the town. In the year 1931 a fully trained nurse, Miss D. K. Morton, was appointed in addition as sister in charge and in the same year a third (probationer) nurse was also sanctioned, and the hospital thus has now a sister-in-charge, a nurse-midwife and a probationary nurse. The nursing and care of patients in the hospital, thanks to Miss Morton's organising ability, is now in a much more satisfactory state than ever before. The nurses live in a building situated close to the hospital and built by the Prince of Wales' Nursing Association, Crater Branch (referred to in Section IV.) specially for the purpose.

The hospital treats on an average, 1,300 in-door and 10,000 out-door patients a year.

PRINCIPAL DISEASES.

The principal diseases for which patients seek admission in the Civil Hospital, are:

Malaria.—Most of the malaria patients are from the Interior, and the commonest variety of malaria is malignant tertian.

Hepatic Cirrhosis.—Patients are often admitted with enlargement and cirrhosis of the liver, enlargement of the spleen and ascites. These patients are mostly from the Interior, where malaria and the habit of eating *qât*, (*Catha edulis*) an indigenous plant extensively cultivated in the Yemen, and containing a stimulating and mildly intoxicating principle, are extremely prevalent. To what degree either of these factors is responsible for the condition, it is difficult to estimate, but the extent to which *qât* is consumed, sometimes by the *more well-to-do in quantities to the value of five or six hundred* rupees a month, suggests that its ultimate effect on the organism, by absorption of the toxic principle, may well be harmful. The extent to which *qât* is consumed in the Interior where it is very cheap, may be judged from the fact that in Aden, where the cost is high, the octroi revenue from imported *qât* is, in a normal year, Rs. 70,000 per annum, the value of the *qât* itself being Rs. 400,000 or approximately *£ 30,000.* The writer is making arrangements for the investigation of this drug at the Calcutta School of Tropical Medicine through the courtesy of his colleague, Lieut.-Colonel R. N. Chopra, I.M.S., Professor of Pharmacology.

Pulmonary Tuberculosis.—This disease is extremely common both among the local inhabitants and people from the interior. Debilitating climatic conditions, unhygienic surroundings, privation and other existing diseases are all important predisposing causes of the disease.

Venereal Disease.—Gonorrhœa is by far the most common venereal disease. Unfortunately, patients seek treatment only when the disease is well established and discontinue it as soon as the obvious signs and symptoms have disappeared. Under the rules of the Aden Settlement, any prostitute who is declared or suspected to be suffering from a venereal disease is required to present herself for admission and remain in the Civil Hospital for treatment until she is certified to be clinically free from the disease.

Dysentery is fairly frequent, and mostly of the bacillary type. Amœbic dysentery is rarely met with in Aden.

The surgical conditions for which patients most commonly seek admission to this hospital, are the following:

Vesical Calculus is very common. Climatic conditions, hardness of water, infection of the urinary tract, and probably a diet deficient in accessory food substances are the principal predisposing factors.

Fractures form a special problem. The illiterate element of the population is very impatient of any form of restraint. Carefully applied splints are sometimes taken off within a few hours of their application, and in spite of repeated warnings, patients begin to walk before callus is firmly consolidated.

Inguinal Hernia is a common condition met with amongst the Arabs and Jews of Aden.

Mycetoma is fairly commonly met with amongst patients seeking admission from the hinterland Out of thirty-two cases seen during the last four and a half years, thirty were of the black variety and only two of the yellow variety.

Tropical Ulcer is one of the most common of the disabling diseases treated in the Civil Hospital. It is met with principally amongst Arabs from the hinterland. Malaria, colitis, privation and tropical climatic conditions generally all tend to aggravate the condition. As commonly described, spirochætes and fusiform bacilli are frequently found in the discharge from these ulcers, but the real causative agent is not known. The condition involves prolonged hospital treatment; it results in serious deformity and amputation has often to be resorted to in severe cases. *Cancer* is a rare disease among people seeking admission to the Civil Hospital, similarly *appendicitis*, *gastric* and *duodenal ulcers* and *tetanus* are rare conditions. Not one case of *tropical abscess of the liver* has been met with in this Hospital for the last four and a half years.

MEDICAL WORK AMONG WOMEN.

Medical work among women is a branch of medical activity which is making but little headway, but it presents great possibilities. At the present time progress seems to have been arrested and the difficulty of further advance is mainly on account of the immense barrier which intervenes between medical aid and the women who need it, owing to the existing traditions and customs of the Mohammedan community and to the want of suitable provision for the better class patients in the female section of the hospital by means of family wards composed of separate units.

Previously to 1926 there was no Lady Doctor at the Civil Hospital and such women as were willing to be admitted were looked after by the male staff. In 1926 a Lady Doctor was appointed who held the post for three years, but unfortunately little progress was made with the work during that time. In the year 1931 another Lady Doctor was appointed who resigned her post after a year's service. In April 1932 the present Lady Doctor, Miss Brooks, was appointed, and these frequent changes have been responsible to some extent for retarding progress in the women's section of the hospital The hospital needs of the women are met by means of women's wards in a separate block which stands in the grounds of the Civil Hospital to which it is administratively attached, but, although in itself having all the necessary features of a *purdah* ward, it lacks, owing to its location in the precincts of a general hospital, the complete privacy and the special facilities for women which characterise a *Zenana* hospital. This block has two small private rooms and two general wards, and a small hut-ward stands close by which is used for female tuberculosis and "road-side" cases—beggars and homeless women. There is a special ward for Jewish women, who do not observe the *purdah* system, in the same block as that for Jewish men. The total number of beds for women is at present thirty, but when the tuberculosis ward is ready, four more will be added to this number. The female wards are principally made use of by Arab women from the interior who are not strictly *purdah*. There is reason to think that if the women's section of the hospital were entirely separated from the male side, on the lines of a *Zenana* Hospital in India, the women of Aden might be willing to make fuller use of hospital in-patient treatment than at present. This, however, would be a costly project, which cannot be considered at present. The out-patient department, recently re-built and re-organised, is largely attended principally by Jewish women, and there has been an encouraging increase of numbers and volume of work carried out during the past year.

The principal diseases met with among women are trachoma; chronic ulcers; mycetoma; gynæcological diseases, such as sterility,

uterine displacements, inflammatory condition of the adnexa due to improper care during confinement and the puerperium; tuberculosis, chiefly pulmonary; and venereal disease. Gonorrhœa is common but attempts at radical treatment are unsatisfactory because patients will not persevere with treatment after the acute symptoms have abated Local cases of syphilis are rarely met with, though they are not infrequent among patients from the interior.

THE EUROPEAN GENERAL HOSPITAL.

The European General Hospital is an institution built, maintained and entirely financed by Government—at present by the Government of India. The annual cost to Government, excluding the moiety of the pay of the Medical Officer in Charge, who is also Health Officer of the Port and Civil Administrative Medical Officer, which is theoretically debitable to it, is about Rs. 36,000. Its income is derived from fees charged to patients which vary from Rs. 3 per diem, (*exclusive of nursing charges which are separate,*) *to* Rs. *10* per diem, according to the class to which the patient belongs, and these charges are assessed in accordance with a fixed scale sanctioned by Government. The income from fees thus realised is in the neighbourhood of Rs. 6,500 per annum.

The hospital is equipped for twenty-eight beds and the accommodation comprises a large and a small ward on the upper floor of the main block for male European patients, a small ward below for Anglo-Indian and Goan patients, two small wards on the upper floor of a detached block for European women patients, and a ward in the same block, below, for Lascars and other Oriental seamen from the shipping. Local Indians, Arabs, Jews and other Orientals and Africans are not admitted except in cases of great emergency. There is a small out-patient department with an attendance of thirty or forty daily. The out-patients are principally government servants and employees of the Port Trust, and shipping firms. The remaining accommodation comprises a rarely-used mental ward of a barbarous and obsolete design and an isolation ward for cases of minor infectious diseases such as measles and scarlet fever. The staff consists, in addition to the Medical Officer in Charge, of a Resident Medical Officer, Assistant-Surgeon E. A. Eates, I.M.D., who is a Military Assistant Surgeon in Civil Employ, two Subordinate Medical Service Officers (Indians) lent from the Bombay cadre, a compounder, a dresser, kitchen staff and a complement of ward boys and dhooli-bearers, and others, recruited from the interior of Arabia, and principally from the district of Beidha.

Nursing is provided by a staff consisting of a Matron, Miss J. Coulter, and three fully trained nursing sisters, all four trained at one or other of the great *teaching hospitals of the* United Kingdom,

PLATE IV

(TO ILLUSTRATE SECTION III)

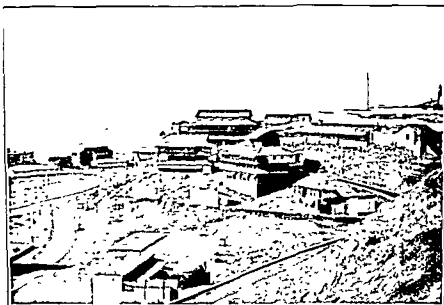


Photo Coutinho, Aden

EUROPEAN GENERAL HOSPITAL, ADEN:
General view showing, on the left, the pier at which patients are disembarked.

all State-registered and all possessing the diploma of the Central Midwives Board. The nursing staff is maintained by the Prince of Wales' Aden Nursing Association of which organisation an account is given in Section IV. The nursing fees prescribed by Government are charged in the hospital bills, the amount realised being eventually credited to the Association. The nursing staff is very inadequately housed partly in a detached building within the Hospital compound, and partly in an annexe of the Hospital itself, originally constructed as a sisters Duty-room. A scheme has been sanctioned for the building of new Sisters' Quarters on the reclaimed ground below the Hospital, but no funds have been allotted.

The European General Hospital does not differ from other small European civil hospitals except in the rich variety of its *clientèle*, which embraces representatives from almost every European maritime country, and the East; and, like many small hospitals, it seems to present a wealth of interesting clinical material quite out of proportion to its size. The bulk of its patients are from ships: either officers, crew or passengers, though it serves the needs of the local European and Anglo-Indian population as well. It is no uncommon event to find at one time in the wards patients representing five or six different countries and able to speak and understand, as a rule, no language but their own, and this adds very considerably to the difficulty, and also to the interest, of attending to them.

The hospital has, traditionally, a very good name among captains of cargo ships which form the main traffic of the port, and this sometimes operates, rather paradoxically, to the disadvantage of patients, as a ship's captain, having no surgeon to advise him, will sometimes, with the most humane intentions, deliberately keep on board until they reach Aden, cases which ought to have been dealt with at some previous port. A ruptured urethra with extravasation, for instance, kept on board a week longer than it need be, may be a tribute to the hospital, but it adds very much to the difficulties of treatment, and to the mortality.

From the administrative stand-point, however, the hospital, whatever its reputation among mariners, must be regarded like most hospitals of its kind as a costly institution in relation to the number of patients which avail themselves of its accommodation. The average number of beds constantly occupied is about seven, and even this slender figure is tending to diminish with the greater reluctance of ship's captains to land their men in hospital owing to the current financial stringency—nowhere more apparent than in the shipping industry. The question has been raised whether the hospital can justify its existence in view of its overhead charges which are undoubtedly high, and more than one suggestion has been put forward for an alternative scheme of hospitalization of European civilians

[illegible] on board ship as well as from on shore; such, for instance, as building a special ward for their reception at the Civil Hospital, and alternatively, their accommodation by special arrangement with the British Air Ministry, in the Military (Royal Air Force) Hospital at Steamer Point. The former would infringe the generally accepted principle that European patients should have the right of European medical attendance and the latter would imply the abrogation of so many existing regulations and the introduction of so many new ones that it can hardly be regarded as being within practical range. The question is at present in abeyance. It was represented to Government that the high cost of this institution to Government was largely due to the unnecessarily heavy Government subsidy of patients to the majority of whom the Government were under no sort of moral obligation, as the majority of them were either foreign nationals, or British seamen whose sickness-risk was carried by insurance and not by the individual seaman. As a result of representations made, the hospital moiety of the total charges (which include nursing fees) was increased by 100% and this brought the charges into line with the charges in similar maritime hospitals, such as those at Port Said and Colombo. The Government subsidy of each patient now represents about 60% of the patient's bill instead of over 83% as it was before.

The effect of these altered charges on hospital finance is now being watched, and in the writer's opinion, the European General Hospital will be able to justify its continued existence, particularly in view of the difficulties to be apprehended in providing a satisfactory alternative scheme of hospitalization for civil European patients.

THE KEITH FALCONER MISSION HOSPITAL.

The South Arabia Mission (Church of Scotland) was opened in 885 by the Hon. Ion Keith Falconer and his wife and the following 'ear the medical work of the Mission was inaugurated by Dr. Corvan. The first twenty years of the Mission's activities were gravely handi-apped by the intensely malarious nature of the locality in which the Mission work was started.

Sheikh Othman was then a hotbed of malaria, and the early history of the Mission is a moving story of a succession of brave men and women pursuing their beneficent work in the face of almost impossible odds. Many of them died of the disease; the rest were ultimately invalided home broken in health, in many instances after but a few months' residence in Sheikh Othman; but the work still went on. The story of cleansing of this plague-spot—for it was nothing less—which will always be associated with the name of Lieutenant (now Lieut.-Colonel) H. M. Wightwick, is recounted in Section VII

Keith Falconer died the following year from malaria and his wife was invalided home full of malaria. Dr. Corvan was invalided home in 1888 and was unable to return. Dr. Paterson was carried on board ship with high fever in 1890 and went home. Slave children rescued by the Mission were sent to South Africa the same year as so many were dying of malaria and a Mr. Lockhart accompanied them though full of malaria. Dr. Zaysonn was invalided home after a few months' service and both Mr. and Mrs. Gardner after repeated sick leave retired in 1895. Dr. Miller succeeded him but he lost his young wife from malaria and he himself was invalided home with the same disease in 1898. Then came Dr. Morris and his wife. They lost their child from Malaria and both of them were full of malaria when forced to resign in 1905. The famous Dr. Young came out in 1892 and in spite of several attacks of malaria managed to stay on and he was able to carry on till he died in 1926 - after 34 years service in She [illegible] n.

under the heading of Malaria. In 1893 Dr. J. C. Young arrived, and he was destined to remain over thirty years at his post, and carried on his great work among the Arabs of the interior and the local Arabs until, still in active service, he died in 1926. So long a period of service in Sheikh Othman would hardly have been possible for any one but for the greatly reduced incidence of malaria which rewarded Lieutenant Wightwick's efforts, and no one realised the value of his anti-malarial work more surely or more gratefully than Dr. Young himself. During the period of Dr. Young's long service at Sheikh Othman, the Mission Hospital grew to be a great power for good in Southern Arabia, and Dr. Young's personal gifts and his upright and forceful personality commanded respect and admiration throughout the Yemen. During the thirty-three years of his service the institution grew from small beginnings to a well-equipped hospital of fifty beds with nearly 700 in-patients annually, and four or five hundred major operations a year.

The staff consists of the Medical Superintendent, Dr. P. W. R. Petrie, who succeeded the Rev. Dr J. C. Young, one other medical missionary, Dr. Robert Napier, two trained British nursing sisters and five medical assistants.

As referred to elsewhere, the Mission undertakes, on behalf of the Aden Settlement the care of the Aden Leper Hospital and a Venereal Disease Clinic, also subsidised from Settlement funds, is maintained by the Mission Hospital, free of charge for the poorer classes of the village of Sheikh Othman, where the greater number of the Aden prostitutes live, and where venereal disease is apparently more rife than in other parts of Aden. During the the past year 280 persons received treatment at this clinic, 228 cases of syphilis, of which 42 were among females, and 52 cases of gonorrhœa, of which one was a female. The proportions of these diseases as seen at Sheikh Othman are in sharp contrast to the experience at the Civil Hospital where gonorrhœa accounts for the great majority of venereal disease treated, and syphilis is comparatively rare.

The total cost of the Keith Falconer Mission Hospital is about Rs. 25,000 annually, which, apart from the subsidies referred to above, is defrayed entirely from the Mission funds of the Church of Scotland.

SECTION IV.

ORGANISATION OF SICK NURSING.

The Prince of Wales' Aden Nursing Association, (Steamer Point Branch): The Prince of Wales' Aden Nursing Association (Crater Branch).

The first attempts at the provision of a Nursing organisation for Aden were made in the year 1896. Previously, the European General Hospital, which had already been in existence for many years, had no regular nursing staff, and employed, on serious cases only, partially trained nurses who happened to be practising in Aden and who were free to help in the hospital from time to time as required. Less serious cases received no nursing attention at all and were looked after by the untrained Arab staff of the hospital.

The Aden Nursing Fund.

In 1896, Major General C. A. Cunningham, the then Resident, was so impressed with the necessity of providing a permanent nursing staff that he set about raising funds for the purpose, and thanks to his energy and resource, the necessary fund, a purely private fund, was raised and a regular nursing system introduced. The correspondence in the archives of the Nursing Fund shows that General Cunningham, through influential friends in England, obtained the consent of His Majesty King George V., then Duke of York, to becoming the Patron of the fund, but there is nothing on record to show that this was formally approved by His Majesty and the Fund never received any Royal title.

The first nurses were provided by the Franciscan Order of nuns. The nuns were trained, or partially trained, in France, and many of them were unable, on arrival, to speak English. These devoted women worked for very long hours—their day duty was from 7 a.m to 8 p.m.—for little more than bare maintenance, and furlough to Europe was a rare occurrence, and always at the expense of the Order. This system continued for over twenty years, until 1921, when the Headquarters of the Order in France were compelled to withdraw them owing to the Order being short-handed in their own country.

Throughout this period, and the period which followed, the fortunes of the Nursing Fund are closely identified with the name of Mr. E. Somerville Murray, O.B.E., who made it his hobby and acted

as its Honorary Secretary and Treasurer for a large proportion of the forty years he lived in Aden, and who, after resigning the secretaryship remained its faithful friend and counsellor for many years until his recent retirement.

The withdrawal of the Franciscan nuns in 1921 necessitated the initiation of some alternative scheme to replace them. It was impossible by then to dispense with a nursing staff for Europeans, and the Committee of the Fund, the strict title of which was "European General Hospital Nursing Fund," decided that trained nurses should be engaged in future and that the Government of Bombay should be asked for assistance in accordance with certain rules existing for the Presidency. It was considered that the time had come to enlarge the scope of nursing generally, and enable the non-European population to share in the benefits of skilled nursing. It was decided, therefore, to ear-mark the existing funds for nursing at the European General Hospital, as all the money had been subscribed for that sole purpose, and to make additional provision for the introduction of nursing at the Civil Hospital for Arabs, Indians and other non-Europeans.

The Aden Nursing Association.

To give effect to these proposals the Aden Nursing Association was formed, which included two sub-committees—one to administer the nursing of the European General Hospital; and the other to act similarly for the Civil Hospital. At about the same time, the merchants of Aden collected the sum of Rs. 9,000 towards an endowment fund for the provision of a Lady Doctor at the Civil Hospital. The Aden Nursing Association raised by subscription, from the same generous source, the sum of Rs. 40,000 for its extended activities, and they were then in a position to approach Government for help in financing the nursing at the Civil Hospital. The negotiations at that point coincided with the brief visit to Aden of His Royal Highness the Prince of Wales, then travelling on H. M. S. "Renown" to Bombay, and the subscribers' committee desired to take the opportunity of that auspicious occasion permanently to endow the Aden Nursing Association and assist the Fund, previously referred to, for the provision of a Lady Doctor and trained nurse for *purdah-nashin* women. The committee sought His Royal Highness' patronage for this worthy object, which was graciously given, and there followed a letter, here reproduced, from the Prince's Private Secretary, Vice-Admiral Sir Lionel Halsey, authorising the re-naming of the association as "The Prince of Wales' Aden Nursing Association," a gracious act which afforded the greatest satisfaction and encouragement to those who, like Mr. Somerville Murray, Sir Hormusjee Cowasjee Dinshaw and Mr. Menahem Messa, had taken a principal part in the inception of the scheme :—

H. M. S. "Renown,"

At Sea,

Aden—Bombay.

13th November, 1921.

"My Dear General,

"With reference to the request made that the Aden Nursing "Association should be allowed to be re-named 'The Prince of Wales' "Aden Nursing Association,' I am desired by His Royal Highness to "ask you to be good enough to inform the Association that His Royal "Highness has very great pleasure in acceding to this request.

"In doing this he desires also that you will be good enough to "inform the Association that he wishes them all possible success in "the good work which they have started, and he is particularly glad "that the Association should now have taken under its care the "Indian population in addition to their former work of looking after "the European population of Aden.

"Believe me,

"Yours very sincerely,

"(Sd.) LIONEL HALSEY."

"Major General T. E. Scott, C.B., C.I.E., D.S.O., Political "Resident, Aden."

The Prince of Wales' Aden Nursing Association.

After this auspicious start, the newly constituted Prince of Wales' Aden Nursing Association filed Articles of Association and was duly registered. It then applied to Government for affiliation with the Bombay Presidency Nursing Association, and, affiliation having been effected, it applied to Government for a grant on the terms admissible for registered and affiliated Nursing Associations, and a request was made for assistance in the provision and financing of the Lady Doctor. The Government of Bombay agreed to an annual subsidy of the nursing at the European General Hospital, roughly on a 50% basis of expenditure, amounting to about Rs. 9,500 per annum, and later agreed, as a contribution to the solution of the difficult with regard to medical treatment of *purdah* women, to defray entire cost of a Lady Doctor with suitable qualifications. This an unexpected windfall and the Committee of the Lady Doctor F

thereupon decided to hand over their accumulated sum of Rs. 9,000 to the Nursing Association to be credited to the endowment fund for the provision of nurses at the Civil Hospital, which was thus provided with a nucleus of Rs. 49,000 as an endowment.

The Steamer Point Branch.

The Association had thus arrived at a point at which it possessed two branches, separately financed, for nursing at the European General Hospital and at the Civil Hospital respectively. The branch relating to the European General Hospital, later known as the Steamer Point Branch was in the stronger financial position and had the greater responsibility of maintaining a going concern. Its capital funds amounted to about Rs. 120,000 and its expenditure was in the neighbourhood of Rs. 20,000 per annum, the principal items of expenditure being on the salaries and passages of the nursing staff, which consisted of a Matron and three nursing sisters trained in India and brought from Bombay. Its income was, and still is, derived partly from subscriptions from shipping firms, partly from interest on invested funds, partly from fees recovered from patients, and partly from the Government grant previously referred to, equivalent to 50% of total expenditure. The branch relating to the Civil Hospital on the other hand, later known as the Crater Branch, were merely at the time custodians of accumulated funds intended to finance nursing at the Civil Hospital as soon as financial circumstances seemed to warrant it.

Nursing arrangements at the European General Hospital proceeded on the lines indicated until the year 1927, when the first Matron, Miss N. Stuart Fergus, resigned after six years of valuable pioneer work, and was replaced by the present Matron, Miss J. Coulter, who had been trained at the Manchester Royal Infirmary and had been occupying the important post of Matron at the Mitford Hospital, Dacca, Bengal. Three years later it became evident that the standard of nursing as carried out by the Bombay-trained nursing sisters was not sufficiently high, and it was decided to employ, in future, only nursing sisters who had been trained in the United Kingdom. This led to a financial difficulty over the greatly increased cost of passages, but after prolonged negotiations, the Government of Bombay agreed to bear half the cost of these passages as it did the most of the other items of expenditure. Since 1930 the Hospital has been staffed exclusively by British-trained nursing sisters, resulting in a considerable rise in the standard of nursing in the hospital.

The Crater Branch.

The funds of the Crater Branch were wisely invested, and tinued to accumulate until the year 1928 when it was decided to

a start with the provision of nursing facilities for the Arab and Indian population by the appointment of a nurse-midwife and an Indian probationer nurse. Three years later, in 1931, the nursing staff was further increased by the appointment of a highly-trained Sister-in-charge, Miss D. K. Morton, who received her training at the Manchester Royal Infirmary, and on whom devolved the very heavy task of organising the interior economy of the Hospital and nursing arrangements in such a way as to bring them as nearly as possible to the standard of modern requirements. For the past two years this duty has been carried out by Miss Morton with great energy and ability, and although the nursing staff is still quite inadequate for a hospital of 120 beds, the present conditions represent a profound improvement on the conditions which obtained at the time of her appointment.

The further development of nursing at the Civil Hospital depends on the increase in the income of the Crater Branch, which at present is derived from interest on the invested funds, a moiety of the fees from the public, charged, with the Association's consent, by the nurse-midwife for labour cases attended outside the Hospital, from grants from the two public bodies, the Aden Settlement, and the Port Trustees, and from subscriptions and donations from the wealthier elements of the general public, and from distinguished visitors to Aden, among whom may be mentioned His Imperial Highness The Emperor of Ethiopia, and the veteran statesman Sir Prabhashankar Pattani, K.C.I.E., of Bhavnagar.

The proposals, previously considered, of applying for a grant from Government has so far not been proceeded with, as the Crater Branch have hitherto hoped to maintain their activities with their present income, which, however, barely suffices, and future sources of income must either be from nursing fees from the wealthier class of patient admitted to the Hospital—for whom in-patient treatment has hitherto had little appeal—and failing that, from increased subscriptions and donations from the general public. The whole question is bound up with the provision of suitable accommodation for paying patients, and particularly for women patients. The accommodation at the Hospital having been recently so greatly improved, and so many further improvements being in contemplation, it may be hoped that Indian and Arab patients of the better classes, will, before long, evince a greater willingness to avail themselves of the hospital and nursing facilities provided. Until then, it is hardly to be expected that the nursing facilities can be further developed without a Government subsidy similar to that received by the Steamer Point Branch.

SECTION V.

DISPENSARIES.

Grant-in-Aid. Maala Dispensary. *Settlement Fund:* Sheikh Othman Dispensary *Private.* Bai Jerbai Charitable Dispensary, Tawahi, King Edward VII. Memorial Dispensary, Crater; His Highness The Sultan's Dispensary, Lahej.

MAALA DISPENSARY.

The Maala Dispensary was opened in 1909. It is a grant-in-aid dispensary maintained jointly by Government, Aden Settlement, and the Port Trustees. It is at present located in a hired building on the main Maala road, the ground floor is used as a dispensary, and the medical officer in charge lives on the upper floor. The dispensary will eventually be housed in a more suitable building, formerly the property of the Aden Railway, and recently acquired by the Aden Settlement It is intended solely for outdoor patients, any serious cases requiring indoor treatment being transferred to the Civil Hospital at Crater.

The dispensary draws its patients from the employees of various local firms who have their work-shops and wharves at Maala, from sea-faring Arabs and Somalis, whose dhows anchor at Maala and from the local inhabitants, mostly Somalis with a few Arabs and Indian Mohammedans.

The staff of the dispensary consists of a medical officer in charge, a compounder and a dresser. The medical officer is a Subordinate Medical Service Offic[illegible]
Medical Officer, and [illegible]
Hospital at Maala I[illegible]

The average annual number of new patients treated at the dispensary is 4,000, the daily average being 48 and the annual aggregate out-patients being 14,000.

SHEIKH OTHMAN DISPENSARY.

The village of Sheikh Othman was purchased from the Sultan of Lahej in 1882 for the sum of Rs. 50,000. Fifty years ago, the *second Assistant Resident used to supervise the sanitary arrange*ments of Sheikh Othman in addition to his administrative duties,

but later it was found that the sanitary and conservancy arrangements required greater attention than he could give, and it was decided to appoint a medical man who would attend to the Dispensary and supervise the sanitary work, and a medical officer was appointed for these duties in 1890, but he was later relieved of the sanitary duties which were handed over to a Sanitary Inspector.

The dispensary is located in a separate building, built by the Aden Settlement for the purpose and financed by the Aden Settlement at an annual cost of Rs. 4,500 It is mainly for out-door relief work, although a few non-dieted in-patients are occasionally admitted. Serious cases are transferred to the Civil Hospital.

The staff of the dispensary consists of a medical officer in charge, a compounder, a dresser and a sweeper. The medical officer is a Subordinate Medical Service Officer lent to the Aden Settlement and under the control of the Civil Administrative Medical Officer. He is also in charge of the Infectious Diseases Hospital, Sheikh Othman, and acts as public vaccinator The annual average number of new patients is 5,260, the daily average being 70 and the annual aggregate of out-patient attendances being 17, 600

THE BAI JERBAI CHARITABLE DISPENSARY, TAWAHI.

This charitable dispensary, which is largely used by the poorer classes of Tawahi and Steamer Point, was founded in 1895 by the late Mr. Cowasjee Dinshaw, C.I.E., in memory of his wife, Bai Jerbai.

The endowment fund given by the founder was Rs. 50, 000 and the Dispensary has since been maintained principally from the proceeds of the investment of that sum, the annual cost being in the neighbourhood of Rs. 6, 300.

The present medical officer in charge of the dispensary is Dr. M. M. Kutar, M.B., B.S., (Bombay) and the increasing number of out-patients treated—over 5,000 new cases a year—is evidence that the founder's charitable intentions are being fully realised.

KING EDWARD VII. CHARITABLE DISPENSARY, CRATER.

This is one of the oldest medical institutions in Aden. It was founded by the formation of an endowment fund by subscription among the merchants of Aden who subscribed the sum of Rs. 20,000 to commemorate the visit to Aden in 1875 of His Majesty King Edward VII., then Prince of Wales, and the Dispensary was opened in April 1876 by General J. W. Schneider C. B., Political Resident, Aden, under the name of "The Prince of Wales' Charitable Dispensary", which was altered to its present style in 1910.

The Dispensary was at first conducted by an Assistant Surgeon lent by Government. The loan of this officer was discontinued in 1912, since when independent practitioners, graduates of Bombay University have been appointed. The present medical officer in charge is Dr. Jehangir E Mehta, M B., B.S , (Bombay) and the extent to which this dispensary is appreciated by the public is witnessed by the large attendance of out-patients, numbering over 13,000 new cases per annum, and a daily attendance of over 150. The number of out-patient operations performed is over 600 a year.

The management of the Dispensary is in the hands of a committee representative of the leading communities in Aden, of which the ex-officio Chairman is the Chairman of the Aden Settlement, which body gives an annual grant-in-aid The cost of upkeep of this Dispensary is about Rs. 6,500 annually. The invested funds, in Government securities, amount to about Rs 80,000.

LAHEJ DISPENSARY.

His Highness The Sultan of Lahej opened this establishment in 1932 mainly for out-door relief work. This is the first attempt at medical relief of any kind outside Settlement limits and so far it has met with considerable success

The dispensary is financed solely by His Highness, and is located in a suitable building just outside the town of Lahej, twenty-six miles from Aden. The staff consists of a medical officer in charge, a compounder, a dresser, an ayah and a sweeper. The medical officer in charge is a Subordinate Medical Service Officer, who is under the general control of the Civil Administrative Medical Officer and whose services are specially lent to His Highness by the Government of Bombay. The first incumbent of the appointment, Dr. C. J. Vyas, L.C.P.S., was specially selected by the Government of Bombay for this post on the recommendation of the Civil Administrative Medical Officer, and his selection has been well justified

The number of out-patient attendances during the first year of its existence was 11,493. This dispensary is inspected at certain intervals by the Civil Surgeon, Aden, and by the Civil Administrative Medical Officer, and the dispensary is managed, and its records maintained, in much the same manner as if it were a Government dispensary.

The dispensary, in addition to meeting local needs, serves a useful purpose in keeping the Civil Administrative Medical Officer informed of any infectious diseases in Lahej and in the interior which might threaten the Settlement of Aden.

SECTION VI.

HOSPITALS FOR INFECTIOUS DISEASES.

Maala Infectious Diseases Hospital: Sheikh Othman Infectious Diseases Hospital: European Small-pox Hospital, Hedjuff.

MAALA INFECTIOUS DISEASES HOSPITAL.

This hospital is situated in the Maala Plain, well away from human habitations, and approached from the Maala bye-pass road. It was first built in the year 1896, at a cost of Rs. 485. It then consisted of a few rough huts of reeds and matting. Later a more substantial building was added for the reception of European patients, but the accommodation both for Europeans and Asiatics was of a very poor standard. In 1923, the then Resident, Lieut.-General Sir Thomas Scott, convened a committee to report on the accommodation for small-pox cases, and as a result of their recommendations, the hospital was greatly improved and largely re-built at a cost of Rs. 9,100 and the accommodation for Europeans was transferred to a separate site not far away, on Hedjuff Bluff, and in a new building called the European Small-pox Hospital, described below

In 1930, two special observation wards of fly-proof construction were added and are now largely used for imported cases of small-pox in non-epidemic times. In addition to these buildings, the hospital accommodation now comprises an administrative block (the old European wards), large general wards, and several small self-contained family wards which are much appreciated by Mohammedan families. With the exception of the two observation wards and the administrative block, which are permanent structures, the wards are constructed of a masonry and concrete plinth, the super-structure being a light construction of reeds and matting. There is accommodation for one hundred and twenty-five patients but the number accommodated can be doubled if necessary during an epidemic. It is maintained jointly by the Aden Settlement and the Port Trustees. The staff consists of the Medical Officer of Health who is in general charge of the hospital, the Subordinate Medical Service Officer in charge of the Maala dispensary, who is in sub-charge, a ward-boy and chowkidar. The inferior staff is expanded as occasion demands.

SHEIKH OTHMAN INFECTIOUS DISEASES HOSPITAL.

This is a primitive institution maintained by the Aden Settlement, which is under the general charge of the Medical Officer of of Health, and its patients are attended to by the Subordinate Medical Service Officer in charge of the neighbouring Sheikh Othman Dispensary It is situated on the open plain, about a quarter of a mile from the outskirts of Sheikh Othman village, and consists of two separate blocks, one of which was formerly devoted to the accommodation of lepers and the other used for small-pox and other infectious diseases In 1932, the leper patients were transferred to the new Leper Hospital and the block thus vacated is now available for all purposes The staff consists of a chowkidar and cook, and a ward-boy.

This hospital, although primitive in design and construction, serves a very useful purpose, apart from the reception of local cases of infectious disease, of isolating cases of infectious disease discovered among Arabs arriving in caravans from the interior, and acts as a useful means of preventing the spread of infection to the main town of Aden.

THE EUROPEAN SMALL-POX HOSPITAL, HEDJUFF.

The admission and treatment of small-pox cases has always been an important function of medical administration in Aden, not so much of locally contracted cases as of cases imported from outside Aden—Arabs from the interior where small-pox is apparently endemic, and Europeans and Lascars from the shipping, infected either in India or in the Persian Gulf, both important centres for the dissemination of the most virulent oriental variety of small-pox. The former class are accommodated at the Maala Infectious Diseases Hospital described above, which also accommodates the Lascars and other oriental patients from the shipping. The Europeans are accommodated in a specially-built Small-pox Hospital occupying a commanding position on a site known as Hedjuff Bluff, in former years an important feature of the inner military defences of Aden. European small-pox cases were formerly accommoted in a special ward of the Maala Infectious Diseases Hospital but in 1923 it was decided that the conditions at that Hospital were hardly tolerable for Europeans, and the present Hospital on Hedjuff Bluff was built and completed in 1927. The cost of the construction and equipment of this new hospital, which amounted to Rs 25,800, was shared equally between the Aden Settlement and the Aden Port Trust, the latter contributing to its original cost as it does to its up-keep, to which it contributes a third share, on the grounds that the patients admitted to it are almost exclusively cases imported by sea and disembarked from ships in the harbour, the Europeans of Aden having only c

SECTION VII.

PRINCIPAL COMMUNICABLE DISEASES.

Plague. Small-pox: Malaria: Leprosy.

PLAGUE.

The appearance of plague in serious epidemic form is so great a disaster* that it is desirable to consider in detail the history and nature of these visitations, to study the features of a particular epidemic and to discuss the measures designed to prevent its recurrence.

There have been six epidemics of plague in Aden, in 1899-1900 (715 cases), 1903-1904 (2 cases), 1904-1905 (2,299 cases), 1913-1914 (81 cases), 1917-1918 (122 cases) and 1927-1928 (1,494 cases). The natural history of all these epidemics is identical in certain particulars. They all tend to begin in the cold weather months when the mean temperature is in the neighbourhood of 80° F., the more severe epidemics in November and December and the less severe ones later. They all show a tendency to decline with the onset of the hot weather, and in no case has any epidemic extended beyond the end of June, when the mean temperature is usually at its maximum. Another important point in common is that records indicate that in every epidemic, the first cases discovered have been among cargo or coal-coolies who work on ships, and not among the general population. The significance of this is discussed later.

To appreciate the administrative problems involved in a plague epidemic in Aden the writer believes that a detailed consideration of the last plague epidemic in 1927-1928, with which he was closely associated, will be more effective than any abstract observations, particularly as all Aden plague epidemic resemble each other.

On the afternoon of January 9th, 1928, intimation was received from the Police that certain cases of illness attended with mortality were occurring in the Arab Coal-Coolie lines situated in the western

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*Apart from the heavy death-roll and other human aspects of an epidemic, the financial loss to the community is very heavy. The total cost of the measures employed to suppress the 1928 epidemic was Rs. 1,24,000 and the loss of trade to the Port was very great.

part of Tawahi Bazar, Steamer Point. The writer examined all the houses where the sick coolies were lying, and discovered nineteen cases of bubonic plague. These cases were distributed among four houses of one block of nine adjoining houses, and there were none in the neighbouring houses, chiefly occupied by coolies. Police reports indicated that, for a week or two previously a certain number of deaths from "fever" had been occurring among the coolies living in the affected houses, but suspicion was not aroused until the number became manifestly greater than would be accounted for by the usual seasonal mortality. Under the conditions then prevailing in Aden, as in most towns in India, the causes of all deaths among the indigenous population—except in the small minority of cases in which deaths were notified from hospitals or by medical men in attendance on cases—were classified on information received by the Registration Department from friends or relatives of the deceased, and, in the case of the poorer and more ignorant classes, such information is usually of little value for statistical purposes and of even less as a measure of control of infectious diseases. It may be assumed, therefore, that a certain number of plague deaths passed unrecognised, possibly for two or three weeks preceding the 9th of January, when the outbreak was discovered.

The source of the epidemic presented some features which have appeared in all the previous epidemics of plague in Aden, though they are rarely met with elsewhere. The peculiarity in the origin of this and other epidemics of plague in Aden already referred to, is that they start among a particular group of the coolie population who are habitually and exclusively employed on ships, either working cargo or loading or discharging coal In most epidemics of plague introduced into a community previously plague-free, the means of transfer is a plague-infected rat or infected rat-fleas in cargo or other material attractive to rats, such as grain in bags. For various reasons, chief among which is probably the fact that ships, from ports likly to be infected, berth in the open harbour and not alongside a wharf or mole, this evidently does not happen in Aden; for it if did, it is almost inconceivable that the earliest cases should occur without a preliminary rat-epizootic and among a particular group of waterside coolies. The first cases would occur either haphazard among the general population or in the neighbourhood of grain-shops or other centres for the distribution of merchandise of a nature attractive to rats, and preliminary infection of the rodent population would probably be observed. One was therefore led to the conclusion that the introduction of the infection into Aden had been essentially by human means, with or without the co-operation of infected fleas from outside. It was difficult to resist the supposition that certain coolies had become plague-stricken, or infested with plague-fleas, in the holds or bunkers of a ship which contained plague-rats unknown to anyone on board. There was, however, no direct evidence of this, as

no ship coaling or working cargo at Aden at the time when infection must have been communicated was known at the time, or subsequently reported, to be plague-infected.

There was room for conjecture as to the manner in which the disease spread among the coal coolies, after the first case. The writer was personally inclined to the view—then an admittedly unorthodox view, though more recent observations have established it as a well-recognised possibility—that the disease in its earliest manifestations spread from coolie to coolie by the intermediary of the human flea (*pulex irritans*) and that the rodent plague was secondary to the human plague, and not *vice-versa*. Once the infection was established among rodents, as it was after a few weeks, the epidemic took its usual course. It was difficult to explain on any other hypothesis the fact that the first twenty cases or more were absolutely confined to a group of coolies living in adjoining huts in the closest possible aggregation. This view was supported by the finding of Chinese workers in Manchuria, and others, who, in the course of investigations into outbreaks in this respect not dissimilar to the Aden outbreak, appeared to have demonstrated conclusively that the human flea is quite capable of transmitting plague,—a fact which, although long suspected, had never been previously established, for which reason the human flea had never seriously been charged with any material part in the dissemination of plague. The importance of this discovery lies in its application; had the earliest cases in the Aden out-break been recognised, or even suspected, by means of an effective system of death certification, it might well have been possible to isolate the first few cases and bring the out-break rapidly under control, by the means described below, ***before the infection had spread to the rodents*** from which it was destined to be communicated to the remainder of the general population of the town.

Within twenty-four hours of discovering the existence of plague in what appeared to be epidemic proportions, the Port was declared infected, and the prescribed measures authorised under the Indian Ports Act put into operation as soon as practicable. Among the measures taken were:

(1) Evacuation of the affected houses, and those of probable and possible contacts;

(2) Removal of the sick to the Maala Infectious Diseases Hospital, for treatment;

(3) Segregation of the immediate contacts of the cases in an Observation Ward of the Infectious Diseases Hospital;

(4) Segregation of as many as possible of the remote contacts on one of the quarantine islands, Flint Island, where they remained under medical supervision.

(5) Disinfection of the evacuated houses with Sludge oil, after thorough cleansing and incineration of rubbish.

(6) Institution of continuous house-to-house inspection of the remaining coolie lines of the rest of the bazar;

(7) Institution of an intensive rat-campaign ; and

(8) Provision of facilities for anti-plague inoculation.

The object of some of these measures was to endeavour to circumscribe the epidemic within definite limits, and thus prevent its spread beyond its original focus, as from the earliest stages of the outbreak there had been no evidence of a preliminary rat-epizootic, and the chances of success did not therefore seem too remote. The measures proved, however, to be unavailing, and the infection spread until finally all the four divisions of Aden, Steamer Point, Maala, Crater and Sheikh Othman were affected to a greater or lesser extent.

When it became evident that local medical personnel would be insufficient to deal with the outbreak, Dr. Chitre, a well-known authority on plague, and Mr. Mallet, an expert rat-examiner, both of the Haffkine Institute, Bombay, were deputed from India at the request of the Plague Committee, the former was placed in charge of the anti-plague operations, and other medical personnel were brought from India as required. The epidemic reached its maximum in March, and began to decline in April. The following is the summary of the epidemic of plague of 1928 :—

Total number of attacks	 1,494
Total number of deaths	... 1,117
Mean Case-mortality	. 74.2%

The total population of Aden (Civil Station) was 44,885 (1921 Census). Of this number, 31,060 were inoculated ; the vaccine used being mainly that issued by the Haffkine Institute of Bombay The effect on plague-incidence, mortality and case-mortality of the inoculation of this proportion of the population is shown in the following table:

	Population	Attacks	% Attacks	Deaths	% Deaths	Case Mortality
Inoculated	31,060	86	0.28	51	0.16	59 3
Non-Inoculated	13,825	1,408	10.18	1,066	7.71	75.7

It will be observed that there is no very marked difference in the case-mortality of the two groups, but there is a striking difference in the incidence of the disease. Roughly speaking, the risk of an attack to the uninoculated was one in ten, but to the inoculated only one in three hundred and sixty.

The Port was declared free on June 2nd, 1928, and all restrictions as regards passengers, cargo and shipping ceased from that date.

As a special measure of protection to the community during the epidemic period, a system was instituted, similar to that which obtains in Bombay and other large cities in India, of checking the causes of mortality by enquiries instituted immediately after death, in all cases in which no medical certificate is forthcoming.

Port Restrictions.

Ships calling at Aden and lying in the stream worked in quarantine, and communication with the shore was limited to the minimum compatible with the ship's urgent requirements, all unnecessary movements between ship and shore and *vice-versa* being prohibited. Bills of Health and the usual certificates were issued and all passengers embarking at Aden were examined, and their effects, where considered necessary, disinfected. Crews and passengers of all dhows were inspected and disinfected immediately before departure, and all bumboat traffic was stopped. A special temporary shore disinfection-station was built and equipped for dealing with the clothing and effects of deck passengers leaving Aden, to avoid the inconvenience of carrying out the work on Flint Island where the Port Disinfection Station is located, and also for the disinfection of cargo and coal-coolies, nearly all of whom lived in the infected area (Tawahi Bazar). The introduction of disinfection of all such coolies before going aboard was attended with great initial difficulties, but these were successfully overcome, and the system eventually worked quite smoothly, and probably assisted materially in preventing the spread of infection to ships working in the harbour.

Disinfection of merchandise coming under the category of "Plague-suspicious", which had lain in an infected area, was required to be carried out before being released for shipment. The list of "Plague-suspicious" cargo was based on that recognised by the Eastern Bureau, Health Section, League of Nations, Singapore, and adapted to meet local requirements. Disinfection was carried out in a special lighter connected with a Clayton apparatus.

That the Port restrictions were on the whole adequate and effective is evidenced by the fact that, as far as is known, only one case of plague, a deck passenger evidently in the incubation stage of

the disease at the time of embarkation was reported as having occurred on a ship leaving Aden.

Perim Island was infected, presumably from Aden, either by sea or by land, but the outbreak was rapidly brought under control. There is no evidence that any other port or ship was infected from Aden.

It is of importance to record that the two principal ports in direct communication with Aden, *i. e.*, *Berbera and Djibouti, remained* completely free from infection: no cases having been reported from either port. In view of the constant traffic between Aden and these ports, usually four times a week, their immunity from infection may be considered as satisfactory evidence that the port restrictions *in Aden were effectively applied.*

Future Plague Policy in Non-Epidemic Times.

The experience of this epidemic brought into prominence certain weak points in the defences of Aden against visitations of plague. These were .—

1. The system of death-registration then current; the emergency measures that it was found necessary to apply, namely, the introduction of a system of verification of causes of death by *post-mortem* enquiries by medical personnel in each uncertified case, and the inspection of each corpse before a burial pass is issued, were considered so important for general statistical purposes in non-epidemic periods as well as a safeguard against epidemic disease, that they have since been adopted as a routine.

2. The outstanding feature of the natural history of this as of all previous Aden epidemics was its origin among a particular element of the community liable to chance infection on ships, and living under very insanitary conditions scattered about the Tawahi bazar. To have neglected the lesson it presented would have been to ignore one of the clearest and most insistent warnings which the history of plague in Aden has given us. This has been since met by the complete segregation of all coolies employed in handling coal or cargo in four different barracks at a distance of not less than half a mile from the bazar area. These barracks were constructed at the joint expense of the Aden Settlement, the Port Trust and the four shipping companies who employ Arab labour of this kind, the P. & O. S. N. Co., Messrs. Luke Thomas & Co., Messrs. Cory Bros., and Messrs. Cowasjee Dinshaw & Bros. They are to a large extent self-contained: they have their own cooking places

PLATE VI.

(TO ILLUSTRATE SECTION VII)

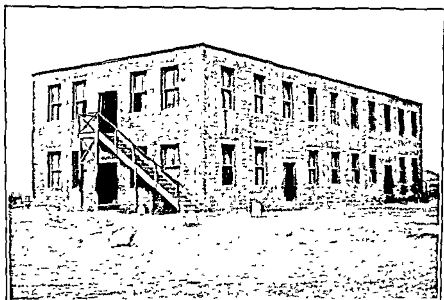


Photo Coutinho, Aden.

ANTI-PLAGUE MEASURES:

View of Coolie Segregation Barrack, at Hedjuff, Aden.

and shops for the supply of all the simple requirements of the coolies who inhabit them. Although before their construction great difficulties were anticipated from opposition on the part of the coolies to evacuation from the bazar area and compulsory transfer to these barracks, none of these difficulties were realised. The inducement of rent-free quarters appeared completely to overcome any reluctance to leave the more sociable atmosphere of the bazar, and the transfer was the easier because none of the Arab coolies from the interior have their womenfolk and families with them. If the next visitation of plague keeps to the traditions of past epidemics, it may be expected to break out in one of these barracks, well away from the overcrowded area, and attempts to limit the out-break to a small isolated group of human beings, before it can spread to the rodent population and thence to the general community, are likely to be attended with much greater prospects of success.

3. The importance of maintaining a stock of active plague vaccine for immediate use on the occurrence of any future cases is sufficiently manifest, and since that time, 5,000 doses of plague vaccine are always at hand, and the stock is replaced by a fresh supply every year. The heavy incidence of plague among the scavenger class who had to work in infected houses in an unprotected condition in the early days of the epidemic must have contributed very materially to its spread, besides causing serious embarrassment to the conservancy department.

4. The rapid spread of the disease both in humans and rodents in the Tawahi bazar led, as stated, to the evacuation of the coolie population from the bazar area, and also to a much needed overhaul of the housing conditions of the poorer classes in the bazar and of the sanitary condition of coffee shops and eating houses which are so largely patronised by the poorer classes. The recent introduction of a drainage system into Tawahi, and the much higher general sanitary standard which now prevails throughout the bazar area cannot but have a favourable influence in combatting in future the effects of the [illegible] of plague. The lessened [illegible] rage for rats, and the more [illegible] all help, but although great improvements have been effected, many conditions favourable to rat infestation, and hence to the spread of plague if introduced, still remain, such as the large number of houses in which goats, sheep, camels and poultry are living side by side with human beings.

The appointment of a well-trained Medical Officer of Health and the consequent broadening of the outlook of the Settlement Public Health Department together with the continuous war against rats which has been waged since the epidemic, the improvement in the design insisted on in the construction of all new grain godowns and goods sheds, give considerable grounds for hope that it will be possible to cope effectively with the next visitation of plague before it has an opportunity of gaining serious dimensions.

Plague Policy during an outbreak.

As regards the actual conduct of an epidemic, the experience of 1928 indicates the value of certain measures adopted then which may well be incorporated in future Plague Policy. These are:

i The value of mass-inoculation with plague vaccine. The very marked effect of inoculation on the incidence of plague is shown by the figures given in an earlier part of this Section, in which it is recorded that the incidence of plague among the non-inoculated was 1 : 10, but among the inoculated, 1 : 360. The effect of inoculation on case-mortality was to increase the chances of survival from about 25% to about 40%—not a very striking difference, but the equivalent of many human lives.

ii The favourable effect of institutional treatment of plague cases on the case-mortality compared with the mortality among cases allowed to be treated in their own homes is represented by the figures 58% for the former and 88% for the latter. Institutional treatment was far from popular and rather more than half the total number of cases were treated in private houses in various parts of the town, in spite of intensive propaganda in favour of hospital treatment.

iii The temporary evacuation of heavily infected parts of the town into camps conducted on communal lines was a popular measure and there is little doubt that it reduced the incidence of plague among the evacuated groups. Communal camps of this sort were established by the Jewish, Mohammedan and Parsi communities.

iv The intensive use of rat-poison in the form of baits made of barium carbonate and *bajri* (spiked millet) dough, together with the usual trapping methods, had in all probability an important effect on rat-destruction, and on the course of the epidemic.

v The enforcement of special rules during the epidemic requiring every case of illness of whatever kind to be notified to the Plague Authority, the insistence on notification by all medical men of all definite or suspicious plague cases and the provision referred to above, and since adopted as a routine, by which no corpse could be removed for burial until the probable cause of death had been certified by a medical practitioner, were all measures of undoubted value.

SMALL-POX.

Small-pox as an epidemic is relatively easy to control in an isolated community, as it cannot persist in the presence of effective mass-vaccination of the population, and, unlike plague, there can be no concurrent epizoötic in the lower animals to act as a reservoir for the infection.

Unfortunately for the purposes of protection by vaccination, the population of Aden has a very large floating element, a constant stream of Arabs and Jews coming to, and returning from Aden by land, another stream of merchants or petty traders travelling between Aden and Bombay, and a third element, the seafaring element, which travels to and from Aden by dhows and other craft, trading with the local Arab sea-ports and travelling as far as the Persian Gulf and Zanzibar. There is thus a continual possibility of infection being imported into Aden from numerous sources; the Yemen, where small-pox is generally believed to be endemic; Bombay, which is rarely free from the disease; from the numerous minor ports of the Red Sea littoral and the south coast of Arabia; from the east coast of Africa, and from the Persian Gulf where small-pox of a very virulent type is frequently prevalent. It is evident, therefore, that in order to maintain the vaccinal state of the population at such a pitch that the chance introduction of small-pox infection will not lead to an outbreak of epidemic dimensions, constant vigilance is required to secure that no unprotected persons, the fuel which, ignited by a chance spark, may herald a conflagration, are allowed to enter the Settlement. This measure is by no means easy of attainment in practice, and even when carried out there remains the mass of the permanent population whose vaccinal state depends on the recentness or remoteness of the last epidemic.

There have been numerous epidemics of small-pox in Aden all of which indicate that the vaccinal state of the population was not at the required pitch of completeness. Epidemics in recent years were in 1915, 1923, when the measures required to suppress the epidemic led to expenditure amounting to Rs. 16,000, and more recently in 1929; some of the features of this epidemic are worthy of record in detail.

Early in 1929, cases of small-pox occurred sporadically, but it was not until March 17th that the epidemic began to assume menacing proportions. This was evident, not from the number of cases reported, but from a suspicious increase in the number of deaths *reported under various heads—such as "phthisis," "dysentery" and* "other causes," for at this time it must be remembered that the system of registration of causes of death by means of medical enquiries after death and by examination of the corpse, which was introduced as an emergency measure during the plague epidemic of 1928 had not yet been adopted as a standard procedure. The relatives and others who gave the particulars to the registration department under the old system would naturally tend to substitute the name of some common disease to avoid the enquiries and the inconvenience which would ensue from reporting a case of small-pox, and for these reasons the general mortality rose rapidly from March 17th until July 6th, when the weekly mortality reached seventy-five, nearly three times the amount of the triennial mean for the corresponding period. Very few cases of small-pox were notified as such, and the mortality in excess of the normal was, in the known absence of any other likely cause, almost certainly due to concealed cases of small-pox. Desultory vaccination was being carried out, but there was no systematic vaccination campaign until later.

On June 6th, a council of action was convened by the Resident to deal with the situation which was now threatening the whole of the town, and at this meeting it was decided, with the object of preventing concealment of cases as far as possible, that the public should be informed that where, in the opinion of the Civil Surgeon, the conditions in any better class houses rendered effective isolation possible, the concession of allowing cases to be treated in their own houses would be granted *This was in theory a move of doubtful wisdom as* it is almost impossible to prevent, in an unvaccinated community, the spread of an infection like small-pox treated in a private house, but it at least had the effect of relieving the apprehensions of the general public who were strongly averse to notifying small-pox especially among their women-folk, for fear of compulsory removal to the Infectious Diseases Hospital, Maala.

After this concession had been made known, the number of reported cases of small-pox increased, and by July 1st, the situation was so serious that it was decided to declare the town and port of Aden infected. The port was then put in quarantine and intensive measures to combat the epidemic were put into operation. With the co-operation of a committee of representatives of various communities, a house-to-house campaign of investigation was inaugurated which was prosecuted with remarkably little friction or resentment. This was an extensive undertaking and required the fullest co-operation

of all civil medical personnel which was supplemented, through the courtesy of the Principal Medical Officer, Aden Command, Royal Air Force, by the assistance of an officer of the Royal Air Force Medical Service, and two British orderlies This work was pressed on until practically every household in the entire Settlement and every collection of human beings in lodging houses, coffee shops and the like, had been vaccinated. The vaccination of the resident population was completed by the end of July. Vaccination was continued without cessation with regard to the immigrants by road, vaccination posts being established on the passes and at the Barrier Gate where the occupants of passing cars and 'buses were inspected and vaccinated on the spot. By this time the idea of vaccination was so familiar that no objections were raised and many persons were voluntarily vaccinated more than once, possibly because the vaccination certificates issued had a certain market value. It is certainly a fact that up to the 5th September, 78,397 vaccinations were performed in an estimated population of 50,000 out of which 55,000 were during the actual epidemic period—July 1st, to September 5th.

In spite of this extensive vaccination campaign, sporadic small-pox cases continued to occur and police observation pointed to certain persons who were suspected of being associated with the concealment of small-pox cases. Certain houses, apparently unoccupied, were marked down as probably sheltering cases of this disease and a watch was placed on each. Emergency powers under the Epidemic Diseases Act had been sought by the Resident, but at that time, Government authorisation had not been received. The Resident therefore offered an amnesty if all concealed cases were immediately given up, and within a few days nine cases were declared, mostly from houses which had previously been suspected by the police and which had been under observation. The declaration of these concealed cases brought the sporadic cases to an end and marked the close of the epidemic. The town and port were released from quarantine by Government notification on September 5th. The total number of cases during this epidemic was 407, with 152 deaths.

Port Restrictions.

The Port was placed in quarantine on July 1st on being declared infected.

Every effort was made to minimise inconvenience to both Shipping and the Port. All shipping agents and firms who were required to board ships regularly were asked to submit the names of all boarding representatives whose numbers were reduced to a minimum, who were all vaccinated, or re-vaccinated, and whose entire families, servants, and other inmates of the house in which they lived were also vaccinated.

For the convenience of ships' crews and passengers the agents were also requested to name a limited number of bum-boat men or *dubashes* whom they desired to supply the ships under their agency with food, ice and other requirements, and to each line was allotted one trader to supply each necessary commodity, different traders being allocated to different lines, to avoid creating a monopoly. All these traders, with their families and the inmates of their houses, were similarly vaccinated and "alongside" passes were issued only after their shops or houses had been inspected and dealt with. Police remaining on board ships whose commanders elected to remain in strict quarantine ("S. Q.") were required to prevent any person coming alongside or on board without being in possession of the proper pass.

All coolies required for coaling or working cargo were vaccinated by a team from the European General Hospital, consisting of the officiating Port Health Officer, at that time Major C. L. Bilderbeck, the Resident Medical Officer, a Subordinate Medical Service Officer, and a dispenser, at a vaccination stall set up by the road-side in the coolie lines at Tawahi. The vaccination of coolies was completed after three consecutive days of intensive work. Thereafter, the agents of shipping lines were held responsible for seeing that only vaccinated coolies were employed, and before work, the coolie gangs were inspected on the Abkari pier by the Subordinate Medical Service Officer, the men leaving their clothing on shore, and being provided with Government clothing which was washed and disinfected daily. It was moreover stipulated that for the "S. Q." Bill of Health the ships' officers were required to see that, in addition to the Port Health directions, the shore coolies were kept as separate as possible from the ships' crews.

As regards passengers, those landing from ships were all vaccinated before leaving the ship, or, after landing, at the European General Hospital. Embarking passengers were inspected before embarkation, at the Port Health Office, and their kit disinfected if that measure appeared to be necessary. Deck passengers were required to proceed to Flint Island where they were inspected by a Subordinate Medical Service Officer, and their kit and clothing steam-disinfected while they bathed in the sea. They then remained on the island until it was time for them to embark.

Owing, however, to the discovery that cases of small-pox were being concealed in the Crater and to the fact that some of these were detected in the houses of some of the better educated and wealthier citizens of Aden who were travelling as cabin passengers it was decided that, in order to safeguard the shipping, passengers of all classes from the Crater should be medically inspected under condi-

tions similar to those prescribed for deck passengers, inspection being made at the discretion of the Port Health Officer. In addition to the precautions already detailed under the "S. Q." procedure, no passengers were allowed ashore, no visitors were allowed on board, and only one or two passes were issued to such of the ships' officers who might have to come ashore on business.

Ships on arrival were given the option

(1) of complying with the "S. Q." procedure and of obtaining the right to the endorsement of their Bill of Health, "Certified that the ship worked in strict quarantine whilst in this Port", or

(2) of having communication with the shore and proceeding as a "suspected ship".

The great majority elected for the former.

Indications for Future Small-pox Policy.

The epidemic of 1929 emphasised certain important administrative points which may be summarised as follows: —

(1) The vital importance of an improvement in the method of registration of causes of death (this has since been carried into effect.)

(2) The effect of mass vaccination in stamping out the epidemic. An amendment of the Bombay Vaccination Act, based on the Burma provincial statute, was drafted by Major C. L. Bilderbeck then acting Civil Administrative Medical Officer, which provided for

a Inspection and re-vaccination of the entire population at regular intervals, a measure which, if carried into full effect, would eliminate the possibility of small-pox epidemics.

b. Compulsory inspection and vaccination of all inmates of houses exposed to infection from an actual small-pox case.

c. Compulsory vaccination where necessary of all immigrants by sea and by land.

A Regulation amending the Bombay Vaccination Act has recently been promulgated on these lines except that

the first item (general re-vaccination) was considered to interfere unduly with individual privacy and was omitted.

(3) The disinclination of the public for hospital treatment, and the strongly expressed desire for permission to treat cases in private houses were generally observed. It is obvious that hospital treatment must be made in future as attractive as *the conditions of isolation and financial prudence will permit.* The writer shares with Major Bilderbeck his doubt as to the wisdom of permitting, except in fully vaccinated communities, domicilary treatment of small-pox which, owing to housing conditions in Aden, could claim no logical sanction, but which might be allowed in particular cases and purely as a matter of expedience. Concessions of this sort are sometimes necessary in dealing with an Oriental population, but the risks of giving such a concession should be carefully weighed against the anticipated results of witholding it.

(4) The provision of segregation camps made sufficiently comfortable to house, without hardship, unprotected contacts during the quarantine period of the disease, is a concession to public convenience which in any future epidemic might be more fully utilised, and money would be well spent which made such camps reasonably attractive. These might be conducted on communal lines as during the plague epidemic. The segregation of contacts in the precincts of the Infectious Diseases Hospital was a highly unpopular measure, and should not again be attempted.

(5) The increased security under the present system of registration of causes of death, although a material improvement, is only relative, and it would appear desirable for the Administration to arm itself with the very wide emergency powers of the Indian Statute known as the Epidemic Diseases Act at the first indication of epidemic prevalence of disease, these powers to be held in reserve until their application appears to be warranted. The delay invariably encountered in obtaining sanction to the application of a restrictive Act such as this may mean a loss of time of critical value.

(6) It is necessary to realise that the increased powers under the amended Vaccination Act do not permit of the constant maintenance of the vaccinal condition of the population at the 100% standard which obtained at the close of the 1929 epidemic: in the absence of suspected or actual sporadic cases, the only compulsory vaccination which can be enforced is :

i Primary vaccination of infants and young children resident in Aden

ii Primary or secondary vaccination, as the case may be, of all immigrants into Aden, irrespective of race, age or sex, at the discretion of the Port Health Officer or the Medical Officer of Health . an immigrant being defined as a person who intends to remain more than 24 hours in Aden.

Apart from these groups there is the great mass of the population which is gradually losing immunity acquired as a result of the vaccination campaign of 1929 and is no doubt becoming slightly susceptible to infection, though many years will elapse before the protective power of their vaccination will have completely disappeared.

MALARIA.

Malaria has long been known to be endemic in Aden, not so much in the Fortress of Aden, that is, Tawahi, Maala and Crater Divisions, which have always been relatively free, as in the village and neighbourhood of Sheikh Othman, a distribution which is plainly in accord with the natural features of the country : the Fortress, sun-baked and waterless, and the more or less verdant oasis of Sheikh Othman where date-palms flourish and where subsoil water, brackish but potable, rises to within a short distance of ground level.

Malaria at Sheikh Othman.

As indicated in the sub-section dealing with the Keith Falconer Mission Hospital, Sheikh Othman in former years was a hotbed of malaria, and particulary dangerous as a place of residence, or even occasional resort, for Europeans, but no effective measures were taken to combat the disease until 1909 when Lieutenant (now Lieut -Colonel) H M W [illegible]
He was [illegible]
measure [illegible]
of 2000 [illegible]
work of Ronald Ross was then beginning to be more widely known, and Lieutenant Wightwick studied his writings and proceeded to implement his teachings with a perseverance and insight that many a medical man might envy, and his achievements in this sphere were such as to leave an indelible mark on Sheikh Othman. By numerous and careful topographical and house-to-house surveys of Sheikh Othman, he discovered numberless breeding places of mosquitoes, culicines and anophelines, and devised, on the lines of Ross's work, suitable measures for dealing with them, including a system of fines for breeding larvæ in domestic supplies of water, a measure which

was legalised later by Government and ultimately extended to the whole of Aden. This work was energetically and unremittingly pursued from 1909 to 1915 and the effect on malarial incidence, insofar as it is indicated by the number of cases reported from the Mission Hospital, is strikingly shown in the following table:—

Year.		No of local cases of malaria at the Keith Falconer Mission Hospital, Sheikh Othman.
1907	....	1937
1908	....	1820
1909*	....	1539
1910	....	1027
1911	....	555
1912	....	508
1913	....	449
1914	....	523
1915	....	460

* Start of anti-malarial operations

In the years 1907 to 1915 the incidence of Malaria had thus been reduced by about 75%. From 1915 to 1917, during the Great War, no records are available, but the Settlement anti-malarial staff continued their work except, of course, when Sheikh Othman was occupied for a short period by the Turkish troops, who removed or destroyed all hospital records. During the years immediately after the War, during which period Lieutenant (then Major) Wightwick was employed in India, the vigilance of the anti-malaria staff was relaxed with the result that the incidence of malaria rose from about 500 to about 1800 cases a year. Major Wightwick was posted once more as Superintendent Sheikh Othman in 1922, and again took over the charge of the anti-malarial operations for a few years with the result that the rate dropped to about 250 a year, while he was in charge. This rate, later, varied within wide limits and gradually rose again until 1931 when Major (then Lieut.-Colonel) Wightwick was again posted to Aden, on this occasion as Acting Resident. Shortly before this, the Settlement had revived the appointment of Medical Officer of Health, and in 1930 Dr. N. M. Hodivala, who had the advantage of special training in malariology, was selected for the post and he attacked the malarial problem with energy. Lieut.-Colonel Wightwick, on arrival at Aden, at once placed his detailed local knowledge of mosquito-breeding places at Dr. Hodivala's disposal with the result that Sheikh Othman was again surveyed with such minute care that probably all the remaining breeding places of anophelines hitherto undiscovered were unearthed and dealt with and malaria incidence declined still further. Even when these breeding places, however, were abolished or brought under control by one or other of the

methods described in Section X. under "Anti-Malarial Measures," the incidence of malaria still continued, though at a much lower level, and the neighbouring village of Dar-al-amir in Lahej territory was suspected. At the request of Lieut.-Colonel Wightwick, His Highness the Sultan agreed to the inclusion of this village in the anti-malarial operations, and it was found to contain numerous breeding places of *anopheles* in the mosque and wells. These were dealt with and malaria in Sheikh Othman still further declined, but was not abolished. Later, a similar village, Halwan, about a mile from Sheikh Othman in a different direction, was suspected and found to be breeding *anopheles* also. This village was dealt with and the incidence of malaria is now in all probability very little above the irreducible minimum—that residuum of cases due to the infection contracted, not locally, but in the interior of Arabia or in the town of Lahej some fifteen miles away in His Highness the Sultan's territory. These cases, and cases of non-malarial fevers reported as "malaria" from dispensaries where exact diagnosis is not practicable, probably comprise most of the few cases now being reported. It must be remembered, however, that cases, among women who live in seclusion, for example, and among the old and infirm, may occur unreported, as such cases might not present themselves for treatment at this hospital.

The following table illustrates the decline and virtual annihilation of malaria in Sheikh Othman in recent years :—

Years.		Local cases of malaria reported at Sheikh Othman (Keith Falconer Mission Hospital).
1921	....	477
1922	. .	1338
1923	. ..	369
1924	....	468
1925	.. .	482
1926	....	672
1927	....	602
1928	....	338
1929	....	218
1930*	....	369
1931	...	167
1932	. ..	23
1933	....	11†
1934	----	NIL

* Dr. Hodivala appointed.

† In none of these cases could the possibility of outside infection be excluded.

This table is comparable with the table given above for the years 1907 to 1915, and they together illustrate the necessity of

constant and unremitting vigilance in the control of breeding-places, and the great value to the community of Colonel Wightwick's early labours in this sphere and of the detailed local knowledge which he acquired during the years he spent in Sheikh Othman. Of this experience Dr. Hodivala, arriving new to the local problems of malaria in Sheikh Othman, was able, with his specialised training, to take the fullest advantage, with the result that the curse of malaria in Sheikh Othman may now almost be regarded as past history, though nothing is more certain than that any relaxation of anti-malarial routine will be followed by its return.

Malaria at the Salt-works.

Apart from Sheikh Othman, the breeding places of *anopheles* are few and far between. Cases of malaria have occasionally been reported from the salt-works owned by the Italian firm, Messrs. Burgarella, but no mosquito-breeding was discovered on their property. On their neighbours' property, however, the salt-works of Messrs. Abdullabhoy Lalljee and of Messrs. Hajibhoy Lalljee, the salt pans and the channels between are made of piled earth, not lined with masonry or cement, and in the seepages from these roughly constructed pans, consisting of highly saline fluid, so concentrated by evaporation that the edges of the puddles are encrusted with salt-crystals, have been found living larvæ of *Anopheles culicifacies*—a remarkable example of adaptation to what one would regard as conditions of life highly unfavourable to survival, yet adult mosquitoes could be bred from larvæ living in test-tubes full of this concentrated brine. A striking proof of the reality of this adaptation is that larvæ transferred from this brine to Sheikh Othman well-water, which is merely brackish, could not develop or even survive, although larvæ of the same species in Sheikh Othman flourish in the local well-water. No larvae have been found in any pools connected at certain states of the tide with the sea; this is presumably due to the hostile action of fish, or other marine fauna.

Malaria in the Fortress.

Malaria in the Fortress is probably almost entirely contracted elsewhere, as there are apparently no breeding places of malaria-carrying *anopheles*. The only anopheline ever discovered by Dr. Hodivala breeding in the Fortress was *Anopheles subpictus*,—a variety which is believed to be incapable of transmitting the disease. The famous Tanks of Aden even when full do not breed *anopheles* or any other mosquito, except occasionally *subpictus* in some of the smaller accessory tanks.

There have been under the writer's observation a perceptible number of cases in Steamer Point of malaria, microscopically con-

firmed, which appeared, from a careful consideration of all the attendant circumstances, to have been due to infection from wind-blown mosquitoes, from across the harbour during the north-east monsoon, originating in the malarious village of Hiswa which lies roughly north-east of Ras Morbut and Ras Boradli where the cases occurred.

The problems of malaria in Aden present, therefore, several points of interest. The chief difficulty now remaining—massive malarial incidence now being, we trust, a thing of the past—is the more exact diagnosis of some of the cases reported by dispensaries as "malaria" on doubtful clinical grounds without confirmatory examination of the blood. The means adopted to improve the statistical value of such data is discussed in Section X.

LEPROSY.

Leprosy is not, strictly speaking, an intrinsic and local problem of Aden, but the leper problem is one, nevertheless, which cannot be ignored. Though not at the moment of serious dimensions, it presents certain unusual aspects arising from Aden's geographical position and its political associations which threaten to give the problem a wider ambit than would at first appear.

It is these circumstances which invest Aden with a special interest. It is the only centre of Western civilization within the Southern half of the Arabian peninsula which therefore becomes a reservoir of cases of leprosy which tend to gravitate into Aden as the only centre of scientific, and, it may be safely assumed, of humane treatment in this vast area. The population of this area is quite unknown an[illegible] of leprosy is equally unknown, but it is [illegible] e montane and sub-montane districts whi[illegible] Protectorate and partly in the independent territory which rises to the fertile plateau of the Yemen proper, a verdant country, the "Arabia Felix" of the Roman Empire, which produces the finest coffee in the world.

It is evident, therefore, that the leper policy in Aden cannot be directed merely to the care and treatment of the greatest number of lepers consistent with financial means, but it must be fashioned on a compromise between humanity and expediency, political as well as financial: accommodation and maintenance on too lavish a scale must inevitably attract Arab lepers in such numbers as would embarrass, or even paralyse, the limited arrangements which can be made for their reception. The accommodation and standard of living require, therefore, to be of the simplest possible character, and simple as they are, they are far better than the Arab is accustomed to in his own village.

The segregation and special treatment of lepers in Aden is of comparatively recent origin. Some twenty-two years ago, the Rev. J. C. Young, M.D., the head of the Keith Falconer (Church of Scotland) Mission, who devoted over thirty years of his life to its service at Sheikh Othman, and died in harness in 1926, called attention to the increasing numbers of lepers from the interior who were presenting themselves for treatment at the Mission hospital, which had then, as it has still, a wide and beneficent connection with the interior of Arabia. The establishment of a leper hospital was considered advisable and in due course it was established as a branch of the Mission hospital at Sheikh Othman, assisted by a small subsidy from the Aden Settlement. Lepers from the hinterland had of course presented themselves from time to time for treatment at the Government Civil Hospital, Aden, and at the local Settlement Dispensary, but no special arrangements were made for their segregation.

In 1923, the Indian statute known as the Lepers Act of 1898, was made applicable to Aden, and the Mission Leper Hospital, or more accurately "ward" was re-organised on a rather extended footing in accordance with the Act, assisted by grants from the Government of India as well as from the Aden Settlement. This Act made provision for the organisation of a Leper Hospital defined the procedure with regard to pauper lepers, and, in particular, prohibited them from following certain trades and doing certain acts which imply a risk of infection to the public.

In 1926, the lamented death of the Rev. Dr. Young led to an important change in the situation: the number of lepers was still increasing, and the Indian Government and Settlement grants were insufficient to cover the rising cost of maintenance. During his lifetime, the Rev. Dr. Young, with characteristic generosity, had been in the habit of meeting all deficits out of his own pocket. After his death, the Mission felt, not unnaturally, unable to continue this private subsidy, and the management of the lepers was handed over to the Aden Settlement Committee, and was established at Sheikh Othman as a branch of the Settlement Infectious Diseases Hospital.

In 1929, the accommodation and standard of equipment at the Infectious Diseases Hospital was considered to be inadequate and unsuitable, and the lepers were then transferred to a building in the pleasantest part of Sheikh Othman which is the property of Government and which was formerly used as a circuit-house, and the medical charge was once more placed in the hands of the Keith Falconer Mission, who are now adequately subsidised from Indian Government and Settlement sources. The general Management of the leper hospital is in the hands of a Leper Board, consisting of Dr. Petrie, Hon. Medical Officer; Mr. A. F. Ferram, I.S.O., Superintendent of

PLATE VII.

(TO ILLUSTRATE SECTION VII)



Photo Coutinho, Aden

THE LEPER HOSPITAL, SHEIKH OTHMAN, ADEN.

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Sheikh Othman; Khan Bahadur M. A. K. Mackawee, an influential Arab merchant, and the writer. The circuit-house has been converted, at the expense of the Indian Government, into a Leper Hospital capable of accommodating twenty-five lepers, including nine females. The hospital stands in pleasant surroundings, in a walled date-garden, and so pleasant is it, as a haven from the rigours of the desert, that, as indicated above, the difficulty which is likely to be encountered is the excessive number of lepers seeking admission. In the words of Dr. Petrie, the present Honorary Medical Officer of the Leper Hospital, "The steady rise in admission rate suggests that we are only starting "to discover the extent of leprosy in the Protectorate and neighbour-"hood. In the first quarter (of the year under report) there were "six cases, in the second, thirteen, and in the third, twenty. "Since this, the Hospital has been full and only three cases were "admitted, but thirty were seen and turned away for lack of "accommodation."

The Arab lepers, although in most cases indigent and accustomed in their own country to a life of penury and partial ostracism, retain the characteristically independent spirit of their race, and are often difficult to handle.

With patients of this type, continuous treatment of selected cases is rarely possible, as no compulsion can be used in segregation, and the restriction of vagrant lepers under the Act applies only to the Settlement of Aden and not to the hinterland. Only persuasion can be employed in the attempt to ensure continuous treatment, the patients being free to leave the Settlement for the interior whenever they wish. The statistical results of treatment can never therefore be very satisfactory, but the hospital's most important function is the segregation of lepers under economical conditions, so that they will not be a danger to the community. It remains to be seen whether the ultimate result of the provision of organised treatment and greatly improved accommodation may not prove to be embarrassing.

Herein, therefore, lies the leper problem of Aden: Aden itself has no vagrant or indigent lepers; the Leper Hospital, maintained at the joint expense of the Government of India and the Aden Settlement is filled to over-flowing with Arabs to whom neither of these bodies is under any moral obligation, other than the common obligation, of humanity. The British Government, which exercises, through the Resident, a political control in the Protectorate, may be presumed, in theory at any rate, to watch over the interests of lepers from protected territory—a small minority, but nobody, other than the Imam of San'a who is not interested in leprosy either in his own domains or elsewhere, can be held responsible for the majority of the leper-inmates of the Hospital, whose home is in the independent territory of the Yemen.

It is not difficult to envisage the probable development of the present position: the gradual drifting of the leper population, numbering, no doubt, many hundreds, from the whole of Yemen and the Protectorate towards Aden. Should this come to pass—and it is difficult to discern, from the present trend of events, any likely alternative—the leper problem of Aden may well develop into a political and administrative problem of considerable magnitude.

PLATE VIII.

(TO ILLUSTRATE SECTION VIII)



Royal Air Force Official

ÆRIAL VIEW OF THE PORT OF ADEN.

SECTION VIII.

THE MEDICAL ADMINISTRATION OF THE PORT: QUARANTINE PROCEDURE.

The Port Rules: The Indian Ports Act. The Revised (Draft) Port Rules. Disposal of Infectious Cases. Quarantine Islands. Deratisation. The Indian Merchant Shipping Act: Inspection of Lascars' Food Supplies. The Port Surgeon's Duties. The Disposal of Dead Bodies from Ships: The Exhumation and Shipment of Human Remains.

The Port Health Officer's work resolves itself largely into the diagnosis and disposal of cases of infectious disease on board ship, and a general alertness to prevent such cases, or other untoward influences, from becoming a danger to the port, the ship, or succeeding ports, and generally in applying the provisions of the quarantine rules of the Indian Ports Act, which in turn, are founded on international agreement. It also involves the visiting of mail steamers at any hour of the day or night, the object being to relieve them, as far as may be permitted by the rules, of any avoidable delay in the execution of their contract. In addition to this, there is the further obligation to issue Bills of Health to out-going ships at any hour of the day or night, which means, in practice, that the Port Health Officer is wakened by a night-orderly to sign documents on an average once every night. The average number of ships to be dealt with every day is between four and five, exclusive of local shipping and dhows which average three or four a day, and all deck-passengers arriving on any of these craft, large or small, are inspected for infectious disease and, if necessary, vaccinated. To assist in this considerable task, a Subordinate Medical Service Officer is detailed for harbour duty.

The Port Rules: The Indian Ports Act of 1908.

It is necessary to consider in greater detail the statutes and regulations from which the Port Health Officer derives his powers and responsibilities. They are derived for the most part from the operation of rules framed by Government under the Indian Ports Act, 1908, for application to individual ports, and are based on the International Sanitary Convention of Paris of 1912, and to that extent are an interpretation of international law.

The Port Rules, however, although adhering, for the most part, to the principles embodied in the Convention of 1912, extend beyond it in several particulars. For example, the infectious diseases recognised by the Port Rules are far more numerous than those contemplated by the Convention of 1912. They comprise twelve diseases: small-pox, chicken pox, measles, plague, cholera, yellow fever, sleeping sickness, typhus, scarlet fever, jigger (infection with *Pulex penetrans*) acute pneumonia and influenza.

It is evident from a consideration of this long list of diseases that the framers of the Rules must have attached, from a national as distinct from an international stand-point, an unusual, and in the writer's view, an exaggerated importance to certain of these diseases, such for instance as measles and scarlet fever; chicken pox was no doubt included, and, in the writer's opinion, properly included, on account of the great difficulty which is sometimes experienced in its differential diagnosis from small-pox. Influenza and acute pneumonia were added later, owing to their importance in times of the pandemic prevalence of influenza which is fortunately rare, although no country has ever, it would appear, succeeded in avoiding its visitations by the application of this or any other means of defence; and jigger was included owing, it would seem, to apprehension during the Great War of the likelihood of its spread from the East African littoral to Indian ports, including Aden. Jigger must in the past have been imported numberless times from East Africa but it has never gained a footing in Aden. The serious disadvantage from the administrative point of view of an unnecessarily elaborate list of "recognised" diseases is that masters of ships, unaccustomed to reporting the minor infectious diseases in ports under other administrations, are inclined to forget or ignore the local Indian rules bearing on them. Many of the Port Rules, moreover, allow the Port Health Officer no option whatever in the application of them, and he is faced with the alternatives of enforcing rules which he feels have no logical sanction and which are merely a hindrance and an inconvenience to the traffic of the Port, or of allowing them to become a dead letter in consideration of local conditions, and for the convenience of the shipping using the Port, a dilemma which is considered in further detail below.

To take a case in point: under the current Port Rules, any ship arriving in Aden from the eastern sea-board of Africa, from Port Sudan in the North to Durban in the South, is, *ipso facto*, a "suspected vessel" within the meaning of the Port Rules, (on the ground that she might be carrying a case of jigger) and such a vessel, if the Port Rules are to be literally enforced, must anchor in a remote part of the outer harbour; must signal the name of the last port touched at; must refrain from communication with the shore; must show certain signals and must report the full

circumstances of the case to the pilot, who will forward any report so made to the Port Health Officer who will then proceed on board, a distance of three or four miles, examine the vessel, and then if satisfied, allow the vessel to proceed to a berth in the inner harbour. The futility of delaying the ship to the extent necessary to enable this elaborate procedure to be carried out in the case of a disease of such trifling importance, is, in the light of local experience, so apparent that the writer, in his capacity as Port Health Officer, has consistently ignored this and all such rules, and in fact, the only circumstances in which he would insist on preliminary anchorage and examination in the outer harbour are in the unlikely event of the arrival of a ship infected with yellow fever. These unauthorised interpretations of the Port Rules, which, for the most part, give no discretion in their application are a constant feature of quarantine work in Aden, and have no sanction other than that of a rational attitude to quarantine matters, developed and confirmed by many years of local experience, and are made on the personal responsibility of the Port Health Officer.

The Revised (Draft) Port Rules.

The publication of the International Sanitary Convention of 1926 which, it may be added, has not yet (1933) been ratified by British India, promised to place quarantine procedure on a more rational basis. The diseases recognised by the Convention as justifying restrictive measures on shipping were limited in that Convention to plague, cholera, yellow fever, typhus and small-pox, and it was hoped that any revision of the Port Rules, based on the new Convention, would be shorn of all but essential restrictions to shipping which could be fully justified by modern knowledge and experience. This hope, however, has not so far been realised. Proposals for the revision of the Port Rules, based on the new Convention, were promulgated in the year 1927, and the opinion of the Port authorities invited on them, but, in their application to Aden, the Draft Rules as revised, promised to be even more difficult of application than the current rules The number of diseases cognisable under the rules is increased from twelve to sixteen by the inclusion of bilharziasis, cerebro-spinal meningitis, diphtheria and relapsing fever, few of which, it is safe to say, could ever be diagnosed on board a ship not carrying a surgeon, and even then only in exceptional circumstances.

But this is not the only difficulty. Certain of the Draft Rules would be scarcely capable of application in Aden under existing conditions. Aden is a port which depends for its prosperity, if not for its existence, on prompt dispatch, and being to so large an extent a port of call, measures which may be applicable in a terminal port, such as Bombay, may be difficult or impossible to apply to Aden.

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To take a case in point: under the current Port Rules, any ship arriving in Aden from the eastern sea-board of Africa, from Port Sudan in the North to Durban in the South, is, *ipso facto*, a "suspected vessel" within the meaning of the Port Rules, (on the ground that she might be carrying a case of jigger) and such a vessel, if the Port Rules are to be literally enforced, must anchor in a remote part of the outer harbour; must signal the name of the last port touched at; must refrain from communication with the shore; must show certain signals and must report the full

very speedily drive away maritime trade to other competing ports in foreign territory where the terms of the International Sanitary Convention are interpreted, without sacrifice of its essential principles, in a manner which does not place an intolerable burden on shipping.

It is the writer's opinion that either the Draft Rules, at present mainly mandatory in character, should be made to a much larger extent permissive, or preferably, that the Port Health Officer, whose charge is unique among ports under the Indian Administration, should be specifically empowered to modify the operation of certain of the rules, particularly those referred to above, at his discretion, without, of course, exceeding the powers conferred on him under the Indian Ports Act, and that the more irksome restrictions on shipping should be regarded, not as a routine, but as the *maximum* extent of his powers, only to be enforced when the necessity for their application is apparent to him; otherwise the Port Health Officer is in a truly unenviable position: if he does his statutory duty he will, without, apparently, achieving any useful local or national purpose antagonise the whole of the shipping interest on whose co-operation he should be, and at present is, able to rely, and he will witness the decline and, it would seem, the ultimate ruin of the port: if he continues in the future, as at present, to modify (without being armed with discretionary powers) the application of the Port Rules, he is usurping the function of the Government which he serves; his position in a juridical sense is untenable, and nothing awaits him (in theory) but official damnation.

Disposal of Infectious Cases.

The cases of infectious disease removed from ships for treatment on shore are, for the most part, small-pox cases, which are accommodated at the European Small-pox Hospital, Hedjuff, or at the Infectious Diseases Hospital, Maala, according as they are European or Oriental seamen, (Lascars, Chinamen, Malays, Japanese, Arabs and Somalis are all accommodated at Maala). Plague cases would be treated on one of the quarantine islands (Twin Island) to avoid the risk of infection of the local rodent population; cholera cases are rarely met with in Aden, as the port is almost out of range for acute cases from India. They would require to be treated under conditions which would admit of constant attention during the acute period, and for this purpose a shore hospital is to be preferred.

The minor infectious diseases such as chicken-pox, measles, and scarlet fever, are now rarely disembarked from ships, as there is usually suitable isolation accommodation on board most of the more modern ships, particularly passenger ships. The Port Rules provide that passengers suffering from measles, scarlet fever, chicken-pox,

Under one of the current Port Rules, for example, a ship free from cognisable disease on board, or, more accurately, a ship whose master believes she is free from cognisable disease, is privileged, and when arriving and leaving between sunset and sunrise, is not medically examined as she is deemed to have pratique under this Rule, and the Bill of Health is issued to her on the strength of a certificate issued by the master. It is this rule which enables ships to enter and leave the port with the minimum delay on account of quarantine formalities, and which, moreover, makes it possible for the quarantine work to be undertaken by a Port Health Officer, single-handed, for it is clear that with prescribed hours of duty from sunrise to sunset—in practice from 6 a.m. to 6 p.m. throughout the year—no one could undertake, in addition, routine night-work to the extent necessary in Aden, where one or more ships arrive almost every night. It might be said that the existence of this privilege would provide an easy means of concealment of infectious disease and is in consequence a menace to the Port, but the writer has never known it deliberately abused. This privilege has been abolished in the revised Draft Rules.

The effect of these Draft Rules generally is that, if interpreted literally, probably one or two out of every three ships entering Aden will come either from a technically infected port—the old ban on the Ports on the East African seaboard being still retained—or will be technically suspect and will be subjected (if the Rules are strictly applied) to a delay in the outer harbour which could hardly amount to less than two hours, and this will constantly affect, (technically speaking), the Homeward mail steamers, and the Outward mails also if Port Said happens to be infected with one or other of the prescribed diseases. If there are actually cases of infectious disease on board, the delay will be even more serious, and the application of the Rules even less feasible, for according to the Draft Rules, any disembarkation of sick persons for treatment on shore would have to be conducted in the outer harbour, three or four miles from the shore, a proceeding which in rough weather is dangerous or impossible, and which would in any case be prejudicial to the patient's interests.

If, moreover, a ship in either of the categories referred to above, is unfortunate enough to arrive after sunset, she would have to lie at anchor in the outer harbour, without communication with the shore, until sunrise the following morning, as quarantine inspections are not carried out between those hours, the only exceptions being the outward and homeward mail steamers, the inspection and clearing of which, at any hour of the night, the Port Health Officer is bound to undertake, and for which he is suitably remunerated by Government.

It will be evident, on consideration, that such conditions, if applied to any considerable proportion of the shipping entering a port of the character of Aden, which is so largely a port of call, would

PLATE IX

(TO ILLUSTRATE SECTION VIII)

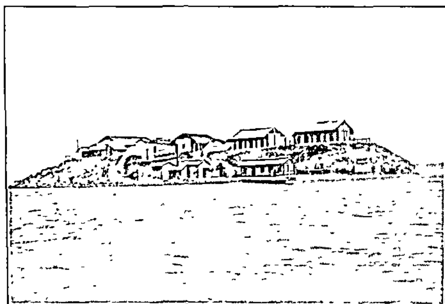


Photo Coutinho, Aden.

FLINT ISLAND QUARANTINE STATION,
Aden Harbour, showing Government Disinfecting Plant.

acute pneumonia, influenza, typhus and (rather surprisingly) cholera and small-pox, if bound for an onward port may not be removed from the ship "unless under the clearest necessity of which the Port Health Officer shall be the judge." This is the type of discretionary power of which more is badly needed in Quarantine legislation. In such a case the "clearest necessity" for removal would almost invariably be apparent in the case of the last three major infections, (under the Revised Rules there would be no option) and, on the other hand, it would only rarely be apparent in the first five minor infections. The term "clearest necessity" does not refer solely to the patient's interests; it might be apparent from the unsatisfactory nature of the isolation provided, the means available for nursing and medical treatment, or even from the psychological effect of the case on the captain, crew or passengers. It is, in short, very rarely justifiable, although provided for in the current Rules, to allow or compel a ship to proceed to sea with a case of small-pox or cholera on board. On the other hand such a rule as this is often of service in supporting a refusal to disembark an uncomplicated case of measles for example, which is merely an inconvenience on board. The disembarkation of infectious cases is never carried out except in the inner harbour.

Quarantine Islands.

There are four Quarantine Islands in the harbour, two of which, Flint Island and Twin Island, are maintained in a state ready for the reception of patients, immediately in the former case and at short notice in the latter. There are two others, Alia Island and Slave Island, which are so remote and inconvenient that the use of them has been abandoned, and they are no longer maintained.

Flint Island is rarely used except for sheltering deck passengers to Aden arriving by ships who enter and leave the port between the hours of sunset and sunrise. They are conducted there by the Harbour Police and suitably accommodated until the following morning when they are medically inspected, and if necessary vaccinated before being allowed to land. Twin Island is maintained as an emergency hospital for any imported infectious disease among orientals, but particularly plague.

Deratisation.

One of the most important articles in the International Sanitary Convention of 1926 is Article 28, which deals with the subject of Deratisation, which provides, *inter alia*, that every ship, except those employed in national coastwise service, shall be deratised or granted, after inspection, a certificate of exemption from deratisation, once every six months. The local ships based on Aden having an international coastwise itinerary, are therefore liable to compulsory inspection

and, if necessary, deratisation under the terms of Article 28, but the Convention itself is not yet applicable to Aden as the Convention has not yet been ratified by British India. The Port Health Officer has under his charge a Clayton apparatus capable of fumigating ships of small tonnage, or of larger tonnage if time is no object, and the plant has been used for deratisation on a few occasions, but, failing ratification of the Convention, and in the absence of any infection or murine epizootic on board local ships, no routine deratisation can be insisted on The Clayton apparatus is maintained in working condition under contract with Government by a local firm, Messrs. Luke Thomas & Co. Ltd., who charge fixed rates according to the known size of the ships, and the cost is recovered from the owners. The process of examination of larger ships with a view to the issue of certificates of exemption, is scarcely possible without a trained staff, and requests from the ships for this service have had to be consistently refused; deratisation by fumigation of ships of large tonnage with the Aden plant would be possible but so protracted a process that no ship could submit to so long a period of economic idleness.

The Indian Merchant Shipping Act: Inspection of Lascars' food-supplies.

Among the other responsibilities devolving on the Port Health Officer is the inspection of food supplies of Lascar crews of British and ships of other nationality, which carry lascar crews

There is little difficulty in assessing the general quality of provisions, whether fresh or dry, put aboard ships for the use of lascar crews, with the exception of one item only—ghee. The quality of ghee supplied to lascars has been specially fixed by the Government of India (Commerce Department) in a notification intended to be read with the relevant portion of the Indian Merchant Shipping Act of 1923. Its application presents so many difficulties in Aden that it may profitably be considered in more detail as a curious administrative problem.

The outstanding factors in the situation are:—

(1) Pure ghee conforming to the very high standard laid down by the Government of India is rarely and probably never imported into Aden.

(2) Ghee supplied by local firms to lascar crews on [illegible] is, according to the suppliers statement, imported [illegible] ghee but on test generally proves to be adulter[illegible]

(3) The ghee cannot be identified as pure or a[illegible]ted

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The outstanding factors in the situation are:—

(1) Pure ghee conforming to the very high standard laid down by the Government of India is rarely and probably never imported into Aden.

(2) Ghee supplied by local firms to lascar crews on ships is, according to the suppliers statement, imported as genuine ghee but on test generally proves to be adulterated.

(3) The ghee cannot be identified as pure or as adulterated

ghee until after technical expert analysis which, as regards Aden, has to be carried out in Bombay.

(4) By the time the Government Analyst's report is received, the ship concerned has left Aden and the ghee has been, in all probability, all consumed.

(5) The offence under the Act is not possession of the ghee on board, but refusal to replace it by genuine ghee which cannot be enforced at the time in view of (3) above.

(6) It is an undoubted fact that adulterated ghee, or "ghee" of frankly vegetable origin, of the better quality, such as that imported from Porbunder, is much more palatable, and probably more wholesome, than the specimens of ghee, rancid but unadulterated, which occasionally find their way to the Aden market. Given the choice, lascars almost invariably prefer the adulterated Porbunder ghee to the specimens of genuine ghee with which comparison is sometimes made.

This portion of the Act is an interesting example of beneficent legislation which, as far as Aden is concerned, has failed in its purpose and, having failed, is put to base uses by dishonest middlemen. The ghee regulations, as they stand, do not help the lascar, (who does not receive the ghee of the quality prescribed,) they do not help the ship owners (who have to pay the price of pure ghee for an imitation one-third of the value of pure ghee); the only parties who benefit are the ghee-factors who make large profits by the sale of artificial ghee in a genuine guise.

The writer has made the suggestion, officially, that the Government of India might consider whether the standard laid down is not too high, in view of market conditions, and whether it is not preferable to permit the supply of a palatable artificial ghee of good quality, which, after all, is what is consumed by the vast majority of the general Indian public, rather than insist on ghee which is technically genuine. This would permit of the Inspecting Officers judging the ghee presented for examination by exercise of their own judgment and by their own unaided senses without reference to an analyst, and they could also then take into consideration the opinion of the crew for which the ghee is intended, a rational aid in the assessment of quality which is now debarred to them. The assessment of the quality of ghee put on board could be settled then and there, and replacement ordered if the Inspecting Officer thought fit, and he would become the summary deciding authority for ghee as he is for other sorts of provisions. The ultimate effect would be that

the lascar would obtain the kind of ghee he likes, the ship-owner would pay an appropriate price for what he buys, instead of three times its actual value; and the machinations of the dishonest ghee-merchant would (perhaps) be frustrated.

The Port Surgeon's Duties.

The Port Surgeon's appointment although a collateral charge of the Port Health Officer's appointment is on an entirely different footing. The Port Surgeon's duties are concerned almost entirely with the rendering of medical aid to the sick on board ships in the harbour, and his *clientèle* is limited to the officers, crew and occasional passengers of ships which carry no surgeon—the great majority of ships using the port, though he is often invited to see a case in consultation with a ship's surgeon. The only link between the Port Surgeon's duties and those of the Port Health Officer is the Port Surgeon's occasional function in recognising and suitably disposing of unsuspected cases of infectious disease which have sought medical aid in ignorance of their nature, and this link is sometimes a valuable one. The fact that he is also Medical Officer in Charge of the European General Hospital, which admits the patients, enables him to know precisely what accommodation is available. Ordinarily the Port Surgeon, summoned on board by a special signal, the "R" (recently altered to the international "W") flag or a corresponding night signal, attends to all cases of sickness referred to him by the master of the ship, and advises the master as to which cases need hospitalisation; which can receive treatment on board while placed off duty; which are trifling cases that do not need to be excused duty; and which are malingering. These are points of great importance to the master of a ship as well as to the patients concerned, and can only be settled satisfactorily by the exercise of rapid judgment based on experience. A ship's crew has no spare hands; and the disembarkation of even one member of the crew for admission to hospital means that so much extra work has to be undertaken by his fellows, and frequently the decision can only be arrived at in doubtful cases by the careful weighing of the respective interests, often in conflict, of the patient and the ship. The patient's interests are naturally the first consideration; generally speaking acute cases, medical and surgical, which require skilled nursing or emergency operations are disembarked, while the nationality of the patient, the direction in which the ship is travelling, and the period of the year are among the considerations which need careful assessment in arriving at a decision. The master of a ship only in the rarest circumstances hesitates to accept the recommendation of the Port Surgeon and it is that fact of the master's dependence on his judgment which makes the Port Surgeon's responsibility the more definite.

If there is one class of patient which is felt by ships' captains to involve a more harassing responsibility than any other, it is the mental case. The disembarkation of all mental cases is eagerly sought by ships' captains, but certain common-sense principles are applicable to the hospitalisation of mental cases, in a port such as Aden, which require to be kept constantly in mind. It is easy to relieve the situation on a ship by disembarking the mental patient and by admitting him to hospital but it is necessary to remember that the majority of all mental cases make no progress towards recovery in the short period that they can remain in Aden and the difficulties of repatriation may be of a formidable character. A ship will usually, quite reasonably, refuse to embark at Aden, a European mental case disembarked from some other ship to whom the owners are under no sort of obligation, except with an adequate number of attendants, at least two, or preferably three. The difficulty of providing attendants suitable for the work and willing to undertake it is almost insuperable, and the expense of fees for attendance on the voyage, and of return passages, is prohibitive. For this reason it has been the writer's constant aim and usually his practice never to disembark a European mental patient on a homeward-bound ship or an oriental patient on an outward-bound ship, and even in the converse case only after the most careful discussion, with the captain of the ship and the agents of the line, of the means of repatriation later.

The hospitalisation of male European mental cases is a particularly difficult matter, as there is no special mental hospital for Europeans in Aden and they can rarely be attended to by nursing sisters, and the only alternative, in the hospital, is attendance by the male Arab staff, which is equally undesirable though for a different reason. In those cases, fortunately rare, in which the interests of the patient make it imperative that he should be landed in Aden, the writer has for some years past obtained, by the courtesy of his Royal Air Force medical colleagues, the temporary loan of three British male nursing orderlies from the Royal Air Force Hospital who assume, very efficiently, the nursing charge of the patient. In extreme cases of difficulty it has even been proposed that British orderlies, soldiers or airmen, should be detailed by arrangement with the Officer Commanding British Forces in Aden, to accompany civilian male mental cases on the voyage home, and in very exceptional cases this might be done, but the cost would be almost prohibitive. For the reasons detailed above, the disembarkation of mental cases from ships is discouraged to the utmost possible extent.

The Disposal of Dead Bodies from Ships: The Exhumation and Shipment of Human Remains.

The Port Rules lay down certain conditions for the disposal by burial on shore of dead bodies from ships. These conditions are that

the case should not have been one of infectious disease or if so, previous formal permission should be obtained from the Port authorities. The writer has added, again on his own responsibility, another self-justifying condition which is more frequently applicable than any other: that the death is sufficiently recent to prevent the possibility of offence to decency arising before the body can be interred. The desire for earth burial, in contradistinction to burial at sea, amounts in Far Eastern and in some Latin races, almost to an obsession, and earth burial is with them only a temporary measure preliminary to exhumation and shipment of the remains to the country of origin. The discussion of these questions is generally conducted in a tense atmosphere. On one occasion, on a large outward-bound foreign liner in port, there arose what amounted to a mutiny on the part of the crew because the writer refused to permit the temporary burial, for six or seven days, of a corpse which was intended to be exhumed after that time and picked up by the next homeward-bound steamer of the same line. The situation, which threatened to be serious from the ship's point of view as the crew had all refused duty, was relieved by the ship's surgeon offering to embalm the body and take it with them on the ship, a proposal in which the writer concurred. The Port Health Officer is sometimes invited, in lieu of permitting temporary earth burial, to embalm the body himself on shore, and retain it for a few weeks in a public mortuary or "*chapelle ardente*" (which does not exist in Aden), an invitation which he has consistently declined.

The exhumation of human remains for other than medico-legal purposes and for shipment overseas is permitted on certain very stringent conditions of which the most important are the authentication of the request through diplomatic channels, the lapse of a certain period since interment, the attestation by the Civil Administrative Medical Officer that the proposed exhumation will not be a source of danger to health, and the provision of a triple shell specially constructed to certain specifications. The cost of such a shell, and the specially high (prohibitive) rates charged by most shipping lines for the transport of human remains, fortunately act as a deterrent and requests for exhumation and shipment of remains are not very frequent.

The duties of the Port Health Officer in relation to the shipping when the Port is declared infected with dangerous infectious disease such as plague and small-pox are considered under those heads. Among the other duties of the Port Health Officer may be mentioned those of Superintendent of the Aden Meteorological Observatory, Examiner of Petroleum for the Excise and *Abkari* Department, and Official Visitor to the District Jail.

SECTION IX.

WATER-SUPPLY AND DRAINAGE.

Early History of the Water Supply: The First Water-Supply and Drainage Scheme: The Second Water-Supply Scheme: The Second Drainage Scheme.

Early History of the Water-Supply.

At the time of the British occupation of Aden in 1839 the wells already existing in the Settlement furnished an adequate supply of rather inferior but potable water. The indigenous population at that time, however, was only 500 and with the rapid increase in their number, which followed the British occupation, the demand for water overtook the supply: the wells were drained dry, and the water deteriorated and became unpotable. In less than ten years the authorities were compelled to look outside the Settlement for some source of increased supply.

The year 1867 was an important one in the history of the water-supply for it was in that year that the Government entered into a convention with the Sultan of Lahej by which they secured the right of constructing an aqueduct from Sheikh Othman and bringing water from two of the best wells there into what is locally known as the Isthmus, in reality the north-eastern extremity of the peninsula. The construction of this aqueduct was taken in hand and completed at a cost of about Rs. 3,00,000. Some fifteen years later, Sheikh Othman was purchased by the British Government and the wells and aqueduct thus became their absolute property. For over thirty years it was in constant use, and, up to the year 1914, this aqueduct was bringing in about 23,000 gallons of water a day.

The year 1867 was also remarkable for the erection of the first plant for condensing water from the sea. This was necessitated by the fact that the Sheikh Othman water was brackish. Two of these installations were erected by Government, one in Crater, and one in Steamer Point. These were followed by others built by the P. & O. Company, by Messrs. Luke Thomas & Co., and by the Aden Coal Company.

Besides these sources of supply there were the historic "Tanks" in the Crater which filled so rarely that they hardly deserve special mention as a source of supply.

The First Water Supply and Drainage Scheme.

In 1904 the Port Surgeon, who had then had twenty years' experience of Aden, brought to the notice of the Settlement Committee the desirability of draining Tawahi, where, he said "the passages between the houses were foul-smelling bogs, saturated with water polluted with excrement." As a result of this, at the request of the Settlement Committee, a sanitary engineer was deputed to visit Aden, and in 1906 a scheme for the drainage of the Settlement costing Rs. 4½ *lakhs* was submitted.

On receipt of the sanitary engineer's report and a representation from the Resident, the Government of Bombay deputed an engineer to enquire into the matter of water-supply. This officer made a survey and prepared a rough scheme for pumping water from wells to be sunk in the Wadi-es-Saghir at a spot two miles below Lahej. The cost of this scheme was estimated at Rs. 20 *lakhs*. On receipt of this report, Government directed that a suitable site for the head works should be leased from the Sultan of Lahej and that plans and estimates should be prepared in detail. A site was duly leased from the Sultan, and arrangements were made with a well-known firm of engineers in England, Messrs. Mott & Hay, to depute a competent staff for the preparation of the detailed project.

The staff arrived in Aden in November 1909 and left in August 1911. As result of their work a report was submitted to Government embodying completely new projects for Water-supply and Drainage. The estimated cost of the former was Rs. 24,87,721 and of the latter, Rs. 7,39,680 without establishment charges.

These projects were as follows :—

(a) *Water Supply.*—This scheme comprised a headworks situated two miles north-east of Lahej containing three collecting wells, from near the bottom of which cast iron draw-off mains would connect with a sixteen-inch gravitation main which would convey the water to Aden. The gravitation main after passing Sheikh Othman, at which point a branch was to be provided, would continue *via* Khormaksar to the heights above the Main Pass where it would terminate in storage and service reservoirs. Before reaching this point, a twelve-inch branch would be taken *via* Maala and Hedjuff to storage and service reservoirs on Barrack Hill. The total storage capacity of the various reservoirs was to be 7,300,000 gallons of water and all the water was to be brought from the headworks by gravity alone. On completion of the well-works a pumping trial was made which lasted continuously (day and night) for eleven days.

During the pumping operations, samples of the water were tal

directly from the pump discharge and were sent to Bombay. Other samples (kept under the closest supervision from collection to delivery) were sent to England for examination by public analysts of the highest standing. The analyses, however, did not tally; the samples of water which reached Bombay were evidently not the same as those which reached England; for the former were condemned as unpotable, but the latter were classified as potable and bacteriologically pure.

As a result of this unfortunate difference in the analyses of different samples from the same source, it was decided to re-open the well and take further samples. This was done in 1914, and although the samples then taken agreed in chemical analysis with those sent to England in 1911, there was a very wide difference of opinion as regards potability among the various experts who carried out the analyses. One opinion was that: "Saline constituents in the amount found present in the water would have no deleterious effect whatever upon the use of the water for drinking purposes." Another opinion on the same water was—"Bottled and sold for use as a mild aperient, to be used by order of a medical man, I should not object to the use of the water." With such conflicting expert opinion it is not surprising that the progress in water-supply has been very cautious.

(b) *Drainage.*—This scheme was designed on the assumption that an abundant supply of water would be available and unless this supply was available the scheme submitted would not have been satisfactory.

Roughly this scheme comprised a complete system of sewers with self-cleansing gradients in the Tawahi area; a pumping station to pump the Tawahi sewage through a cast iron main *via* the Main Pass to the Crater where it would join the main intercepting sewer of the Crater district; a complete system of sewers with self-cleansing gradients in the Crater; and an outfall sewer ending in Fisherman's Bay. Certain populated areas such as Tarshyne and Morbut were not included in the scheme, but provision was made so that the scheme could be extended at any time to include them.

With the outbreak of war in 1914 the whole question of water-supply and drainage was dropped and it was not until 1920 that any further progress was made when a sub-committee of the Settlement Committee was formed to make recommendations. This sub-committee recommended further investigation of the possibility of obtaining a water-supply for Aden and stated "It is understood that any water-supply scheme should be carried out in combination with a water-borne drainage scheme and the Committee is of opinion that the latter scheme is the more important of the two." Messrs. Mott

& Hay were again consulted and supplied a revised estimate of Rs. 34,90,980 for water-supply and Rs. 12,80,085 for the drainage scheme. This was an increase of Rs. 15,43,664 over the original estimate and, after some further correspondence with Messrs. Mott & Hay, these projects, presumably on financial grounds, were finally dropped.

Meantime in 1919 the military engineers had put down numerous shallow tube wells in the vicinity of Bir Ahmed and had found good water in one of these at a depth of thirty-one feet and towards the end of 1920, Mr. E. M. Duggan, the then Chairman of the Aden Settlement, suggested that if deep wells were sunk in the vicinity of Sheikh Othman it might be possible to tap the same table of water as had previously been found at Lahej

In the year 1922 a qualified geologist, who happened to be in Aden, offered to make a report on the possibility of a water supply and he was engaged by the Settlement to prepare a detailed report. Unfortunately, this report was never received, as the geologist died before he had completed his work, but in a preliminary report he recommended that a plant capable of boring to a depth of 500 feet should be obtained and he suggested that good water would probably be found at a point about seven miles inland and about 14 miles from Aden at a probable depth of about 250 feet.

The Second Water-Supply Scheme.

In November, 1923, boring plant was received from India and work was started on a ten-inch bore at a point just outside the Settlement Gardens at Sheikh Othman. This site was chosen on account of its being within the limits of British territory. Work on this bore was carried on under Settlement auspices under the immediate supervision of an engineer from India until the year 1928, when a depth of over 1700 feet was reached. During the boring operations water of varying quality was found at different levels, but boring was continued in an endeavour to obtain an artesian supply. At 710 feet the diameter of the bore was reduced to eight inches, as the ten-inch pipe collapsed at this depth and the broken piece could not be extracted. At a depth of 1,554 feet an artesian flow of 380 gallons per hour was obtained and the engineer in charge reported "analysis of water is excellent". As this flow was considered insufficient, boring was continued and the artesian flow increased, but at a depth of 1,744 feet, when the natural flow had increased to over 1,000 gallons per hour, the water became more saline and the bore was plugged off at 1,666 feet. A further attempt was made to get down to 2,000 feet in the hope of getting beyond the excessively saline water and finding a good artesian flow of less saline water, but owing to mechanical difficulties, no progress could be made and

the bore was finally plugged and it was decided to purchase and install plant for air-lift pumping to increase the flow from the well to 15,000 gallons per hour.

The decision to use air-lift pumping was made on account of the high temperature (140° F.) of the water in the bore, but, although an air compressor was duly purchased and installed in a building specially erected for the purpose, except in cases of emergency, it has rarely been used as the running expenses are disproportionately high and water is obtained in sufficient quantity from the other wells. Power for the electrically-driven air compressor is obtained from the mains, but there is a small generating-set installed in the compressor-house to supply power in the event of failure of the mains-supply.

During the period 1929-30, six other bores were put down, four of these being inside the Settlement Gardens and two outside. These six bores, unlike the first, were sunk to depths varying from 200 to 300 feet as good water was found at 138 feet and again at 205 feet. The first of these shallower bores was fitted with a small centrifugal pump capable of delivering about 5,000 gallons per hour and this water, along with the artesian flow from No. 1 bore, was delivered into an underground tank constructed alongside No. 1 bore. From this tank the water was lifted by another small centrifugal pump to an elevated steel tank adjoining and then allowed to gravitate to the Isthmus through a six-inch cast iron main which had, in the meantime, been laid at the expense of the Indian Government on the line of the old aqueduct, a connecting length of pipe 5,000 feet long having been laid at the expense of the Aden Settlement.

In October, 1931, a Water and Drainage Engineer was engaged from the United Kingdom and when he arrived in Aden the position with regards water-supply was as follows:

As already stated, No. 1 bore had been fitt[illegible] with airlift pumping (which was not often in use) and No [illegible] inside [illegible] Settlement Gardens had been fitted with a small [illegible]gal pum[illegible] Bores No. 3 and No. 4 also inside the gardens had [illegible] fitted wi[illegible] special Bore Hole pumps and bore No. 5 inside the [illegible] and bor[illegible] No. 6 outside the gardens to the North were b[illegible] [illegible] with the same type of pump. Each of these p[illegible] was e[illegible]lly driven and was capable of delivering 10,000 [illegible] of w[illegible] hour so that the total hourly delivery availa[illegible] about [illegible] gall[illegible] The water from all these wells had [illegible] bacteriologically and chemically and [illegible] be p[illegible] fit for drinking, although, on acco[illegible] its [illegible] Clarke's Scale) unfit for use in boilers.

At the Isthmus the water was supplied to camel carts for sale to the public and a four-inch branch-main to the Obstruction Pier supplied water to water-barges for delivery to shipping.

The Royal Air Force had erected a steel tank on a part of Johar Ridge at the Isthmus 230 feet above sea level; had installed pumps for delivering the water to this tank and had laid a six-inch main to *Tawahi and Steamer Point for the supply primarily of* the British Forces in Aden. Four 1½-inch connections to this main were allowed as a friendly concession to the Settlement, two of these being taken to a filling station in Tawahi, for supplying camel carts with water for sale to the public, the remainder were left in reserve.

Briefly, then, the position as regards the Civil population at the end of 1931 was that while a fairly abundant supply of pure water was available at Sheikh Othman, the Civil population of Aden had to buy water transported by gravitation through the six-inch main, from camel carts which could only be filled at the Isthmus and Tawahi filling points. These carts were supplied with 150 gallons of water at the rate of 8 annas per hundred gallons, but the price to the consumer was naturally higher on account of transport charges which were about one and a half times the price of the water. The supply of water to the public by means of these camel carts had all the defects inherent in such a system. Constant supervision was essential to ensure that the lids were in order, otherwise anti-splash devices made of the cartmens' soiled clothing would be improvised. Constant care was required to see that the carts were completely emptied every day, otherwise the ubiquitous *Stegomyia fasciata* would contrive to breed in the "carry-over" from one day to another, and one more than one occasion the public have been supplied with water containing living mosquito larvæ, bred in the cart, and citizens have been actually prosecuted (though afterwards acquitted) for having on their premises water containing larvæ, which had been supplied in that condition by the private cart-owners. Apart from the daily inspection, the carts and the copper pots which are used as measuring vessels are disinfected with live steam from a specially devised boiler, once a month. With all these precautions the water although pure at source, could not be regarded as fit for drinking unless boiled.

The delivery capacity of the six-inch main from Sheikh Othman was no more than 4,000 gallons per hour. The first work, therefore, to be taken in hand by the Water and Drainage Engineer was the laying of a new main. A reinforced brick reservoir with a capacity of 100,000 gallons was built in the Settlement Gardens at Sheik Othman and a fifteen-inch "Everite" Asbestos-Cement main was laid from this reservoir, a distance of approximately seven miles, to the Isthmus where it was connected to an old reservoir which was

reconditioned. Asbestos-cement pipes were chosen in preference to cast iron principally on account of the extreme salinity of the ground in which the main was to be laid. Work on this main was completed in June 1932 just in time to meet the severe shortage of water in Aden due to the hot weather.

The method of distribution by camel cart, with all its inherent possibilities of contamination, still remained the same, and the next necessity therefore was a piped supply to Crater. A pump house was erected at the Isthmus and two sets of electrically driven centrifugal pumps each capable of delivering 10,000 gallons per hour against a head of 180 feet were installed. Two steel-plate tanks with a total capacity of 134,000 gallons were erected on a hill above the Crater entrance to the main tunnel and a nine-inch cast iron main was laid from the Isthmus pump-house, *via* the two tunnels, to these two tanks. From these Crater storage tanks a supply main was laid to the town of Aden and a filling-station for camel carts was opened in the town for the first time in February 1933. The next step was the laying of the distribution mains in the town, and, at the present time, (August 1933), the position is that a network of cast iron mains, varying from eight inches in diameter to four inches in diameter has been laid and a number of houses have connections from these mains and, for the first time in the history of Aden, have running water laid on. Owing to the necessity for a certain measure of economy, due to the definitely-limited quantity of water which can be pumped from the six deep wells in one day, and to prevent water being run to waste and collecting in pools which might form breeding-grounds for mosquitoes, there is no intention of making an unrestricted free water supply; each house connected to the mains is being supplied through a meter and the consumer will be charged for the water used at the prevailing rate which, at present is eight annas per hundred gallons.

The cast iron mains already laid in the Crater form a portion only of the complete scheme for the town and work is proceeding on the laying of the 2½-inches and 3-inches diameter galvanised iron branch mains which will be used to supply the bulk of the houses that will eventually be connected to the mains.

The next part of the scheme to be taken in hand will be the supply to Tawahi. The present arrangement with the Royal Air Force authorities was never intended to be anything but a temporary measure; as the six-inch main is now the property of the Air Ministry, the British Forces in Aden have first claim on the water supplied through it and the connections for Settlement purposes are therefore limited, and are insufficient to allow of a proper system of mains in Tawahi. For this reason and in order to be able to supply Shipping in the harbour more directly without the necessity of

transport in barges from the Obstruction Pier, the Settlement have decided to lay their own main to Tawahi.

The Tawahi distribution scheme will be as follows:

Water from the Settlement Reservoir at the Isthmus will be pumped through a nine-inch main to a reservoir of 100,000 gallons capacity to be erected on Johar Ridge, not far from the Royal Air Force reservoir From this reservoir, a ten-inch gravity main will be run to a point near the Masonic Lodge, at Maala, from which point a branch will be taken to a small reservoir on the hill-side, behind the Lodge, for supplying Maala. Beyond this point, the diameter of the main will be reduced to nine inches and this main will continue to Tawahi where it will supply a reservoir to be erected on the hill-side behind the Crescent. The reservoir will supply the mains and branch mains necessary for the supply of water to houses in Tawahi Connections to the main will be allowed at certain points to supply wharves and other business premises at Hedjuff and Tawahi. For the present this is extent of the water supply scheme, but, later, extensions will probably be made to supply the Post Office Bay area, and elsewhere.

The Second Drainage Scheme.

Although drainage has been so far subordinated in this Section to water-supply, this question, which is so closely related to water-supply, had not been overlooked and in the year 1926, proposals for drainage of Crater and Tawahi estimated to cost Rs. 10½ *lakhs* were submitted to Government. It was however considered unlikely that Government would agree to expenditure on this scale, and a scheme for sullage-drainage of Tawahi estimated to cost just over Rs 1 *lakh* was submitted at the end of 1926. This scheme was later revised at an estimated cost of Rs. 93,151 and in 1930 a grant-in-aid was sanctioned by Government. The scheme, which was for sullage water only, was designed for three times the dry-weather flow at 20 gallons per head per day for a total ultimate population of 9,600. The intercepting and branch sewers were to be nine-inch and six-inch diameter stoneware pipes, and manholes, ventilators, and flushing chambers were to be provided. Provision was made for half-round stoneware pipe channels in the sweeper passages and the then existing arrangement of soak-pits was to be done away with and the soak-pits abolished. Two outfalls were proposed, one for the main intercepting sewer and the other for what was called the Grand Hotel sewer. On receipt of the grant-in-aid this scheme was taken in hand and was completed in 1931. The amount of the grant-in-aid received from Government was Rs. 63,200 and the total expenditure on the scheme from Settlement funds was approximately the same.

In 1930, when the revised drainage scheme for Tawahi was prepared, a similar scheme for Crater was also considered and estimates amounting to about Rs. 10 *lakhs* were prepared for Water-Supply and Drainage Schemes. To cover these estimates a loan of Rs. 10 *lakhs* was sanctioned by Government but up to the present only Rs. 6 *lakhs* have been borrowed and it is unlikely that any more of the loan will be required. As already stated, the Crater drainage scheme, which was estimated to cost Rs. 2,68,749 was designed on similar lines to the Tawahi Scheme, the only difference being that the Crater Scheme was designed for an ultimate population of 23,000 and was therefore on a much larger scale and the sewers were accordingly of larger diameter. Work on this scheme was started in 1932 and it is hoped that it will be completed in 1934.

SECTION X.

PREVENTIVE MEDICINE: URBAN HYGIENE AND SANITATION.

Organisation: Vital Statistics: Conservancy Methods: Markets and Slaughter-houses: Food Inspection: Eating Shops and other Licensed Trades: Housing and Building Standards: Infectious Diseases and Disinfection: Medical Inspection of Schools: Training of *Dais*—Midwifery among the Poorer Classes: Vaccination: Anti-malarial measures: Anti-plague measures.

Organisation.

The organisation of urban Public Health work in Aden is a branch of a central *quasi*-municipal body known as the Executive Committee of the Aden Settlement. This body, resembling in many particulars a Municipality as understood in India or a Borough Council as understood in England, differs from either of these in possessing no autonomous powers, being merely a projection of the direct authority of the Chief Commissioner in whom alone is vested the ultimate statutory power to enforce the various Rules and Bye-laws of the Aden Settlement, and to whom the Committee acts solely in an advisory capacity. In consequence of this relationship, the resolutions of the Committee are not valid until they have been confirmed by the Chief Commissioner. The members of the Executive Committee, nominated by the Chief Commissioner, are representative of the principal communities in Aden and include a Royal Air Force Medical Officer, and the Civil Administrative Medical Officer. The chief executive officer of the Committee is the Chairman, usually a senior officer of the Royal Engineers or of the Indian Public Works Department, appointed by the Government. He is invested with wide executive powers and acts as a link between the Chief Commissioner and the Settlement Committee. The Chairmanship of the Settlement Committee and of the Board of Trustees of the Port of Aden are held by the same officer, and since 1924 by Lieut.-Colonel D. S. Johnston, C.I.E., R.E.

The several departments of the Aden Settlement, among which are Public Works, Public Health, Water and Drainage, Electricity, Registration, and Assessment, work under the direct control of the Chairman. The head of the Public Health Department is the Medical Officer of Health, who, although like other heads of departments

under the administrative control of the Chairman, acts after consultation with the Civil Administrative Medical Officer in all important technical matters. Under the Medical Officer of Health is a Sanitary Superintendent, and three sanitary inspectors who carry out the general sanitary work of the town and supervise the work of the conservancy overseers and menial staff, the mosquito overseers and the rat overseers. The Public Health Department works in conjunction with the Public Works Department in scrutinising all building applications from the public, and co-operates with the Registration Department in mutual exchange of information relative to the Registration of Births and Deaths.

Vital Statistics.

Population.—The total (civilian) population of the Aden Settlement according to the census of 1931 was 45,992, showing an increase of nearly 2,000 on the census figures of 1921. The figures exclude the military and the population of Perim. The following table shows the population distribution by sex and class.

No.	Classes.	Male.	Female.
1	Arabs	18388	10341
2	Indian Mohammedans	2829	2393
3	Somalis	2070	2107
4	Hindus	1992	622
5	Jews	2114	2006
6	Parsis	236	96
7	Native Christians, Indian, Goan, Somali etc.	239	207
8	Europeans	213	39
		28181	17811

GRAND TOTAL 45,992.

The local distribution of this population is as follows: Crater, 23,283; Sheikh Othman (including Hiswa, Imad and Little Aden) 11,051; Maala, 3,849, and Tawahi (including Steamer Point 7,809.

There is a marked disproportion between the numbers of males and females, particularly among Arabs, which is due to the fact that most of the coolie class, and many Arab traders come to Aden without their women-folk.

Births Registration and Notification.—Under the Settlement Rules, all births within the Settlement limits are compulsorily notifiable by the head of the family or his agent under penalty of a fine. Previously to 1930, the fine in default was Rs. 10. There was evidence that many births went unregistered and the maximum fine was increased with the sanction of the Bombay Government in 1920, to Rs. 50. This had but little effect ; the registration of births still remained at a very low level, due to the fact that the mass of the population was so ignorant and was therefore so devoid of any sense of civic responsibility, that fining of individuals here and there had little effect, and was regarded merely as petty tyranny.

The importance of greater accuracy in Birth Registration, on which depends the effective prosecution of compulsory primary vaccination, was brought home by the experience of the small-pox epidemic of 1929, and it was deemed essential to devise some scheme for the improvement of Birth Registration even if it necessitated a charge on public funds. It was decided to entrust the notification of births to the female vaccinators, who, in virtue of their sex, have the *entrée* to houses inhabited by orthodox Mohammedans, and to the mosquito overseers who, though in that respect handicapped by their sex, have to call once every ten days, in the course of their anti-malarial work, on every inhabited house in the Settlement. Both the female vaccinators and the mosquito overseers were, and are still, given four annas for every birth reported and confirmed, which provides them with a useful addition to their emoluments, and the Settlement with most valuable information. This system entails, it may be said, the negation of the ideal of citizenship, but it has had striking results, as shown in Appendix 2.

Previously to 1930-31, mortality was always in excess of registered births, that is, there was no "natural increase" : since the year 1930-31, the number of registered births has shown a steady increase and in 1931-32, and 1932-33 and during the current year; the registered births for the first time in the history of Aden have outnumbered the deaths. It is not to be supposed that this increase is due to any increased fecundity on the part of the population of Aden, probably the reverse is the case owing to prevailing financial stringency; it is, the writer believes, solely due not to the increased number of actual births, but to the increased proportion of registered births to the actual number. It is significant that 77% of all births are reported by the female vaccinators and the mosquito overseers and only 23% by heads of families.

Apart from the improvement in the statistical value of the Birth Registration figures, a fundamental basis of vital statistics, their greater accuracy enables the Public Health Department to ensure, within a very small margin of error, that every new-born child is

kept on the records of the Vaccination Department until it is old enough to be vaccinated, and that the figure representing Infant Mortality, at present, taking the mean of the last three years, at the very high rate of about two hundred per thousand live births, is an approximately correct indication of the perils of the first year of life—perils which are referred to in more detail under Section II.

Deaths: Registration and Notification.—The notification of deaths, although no more and no less a civic obligation than the notification of births, presents, administratively, fewer difficulties, for the evident reason that a corpse has to be openly disposed of, owing to the demands, apart from law, of decency as well as of religious custom, and it cannot be disposed of without a Burial Pass issued by the Registration Department of the Aden Settlement. Numerically, therefore, the registered deaths are almost identical with the actual deaths, a slight source of error being due to deaths of premature, still-born or very young infants, the bodies of which are probably sometimes disposed of in an unauthorised manner.

The elucidation of the causes of mortality, however, is on quite a different footing and, as described under the headings of Plague and Small-pox, was for many years generally based on a verbal statement to the Registration Clerk by the relative of the deceased at the time of application for a burial pass. The Registration Clerk not being a medical man, and the deceased in ninety-five per cent of cases having had no medical man in attendance during his last illness, the resulting entry would be a mere guess, having little relation to the actual cause of death, and no relation at all if the person had died, for example, of small-pox, a fact which the relative reporting the death would carefully suppress with the oriental instinct of avoiding possible trouble. The results were bad enough when the system led to nothing worse than academic inaccuracy in the records of the causes of mortality—the rural statistics throughout India are no better—but in epidemic times, the system was highly dangerous: the community was living on a volcano.

Accordingly, during the Plague epidemic of 1905 and in a more developed form during the Plague epidemic of 1928 and the Small-pox epidemic of 1929, the system referred to in the articles on Plague and Small-pox was introduced, by which no corpse could be buried in uncertified cases, until it had been examined by a Government Subordinate Medical Officer, and until the cause of death had been ascertained by enquiries after death by the same medical officer, who was specially remunerated by the Settlement for this rather irksome duty.

The value of this system was so apparent that it was decided, after prolonged discussion with Government, to continue it as a

routine in non-epidemic times. The system does not claim to provide a really accurate picture of the causes of mortality, but if faithfully carried out, it largely eliminates the danger of concealed cases of infectious disease, and has had some interesting results in the redistribution of the causes of mortality.

Conservancy Methods.

Up to 1906 the Conservancy work of the town of Aden was supervised by an illiterate Arab designated as Conservancy Superintendent. In 1907 an ex-police inspector was appointed for the same purpose: he died shortly after and two soldiers from the British regiment then stationed in Aden were deputed to supervise the conservancy work of the whole of Aden. In 1919, the medical authorities drew the attention of the Aden Settlement Committee to the exceedingly low standard of sanitation then existing with the result that the Government of Bombay were approached by the Settlement with a request to sanction the appointment of a Medical Officer of Health and three trained and experienced sanitary inspectors. This staff was appointed at the beginning of 1921. The first selection of a Medical Officer of Health was not a success and, as recorded elsewhere, the appointment was kept in abeyance after the termination of his contract, and the Sanitary Superintendent, Mr. F M. Mehta was placed in sole charge of all sanitary arrangements under the Settlement committee. This system was maintained until 1930 when, as a result of strong representations made by the Resident, as recorded in Section II., the appointment was revived, and the present Medical Officer of Health, Dr. N. M. Hodivala, was selected for the post.

For administrative purposes, Aden is divided into four divisions, Crater, Tawahi, Maala and Sheikh Othman. Under the Medical Officer of Health, who is one of the senior departmental officers of the Aden Settlement, there is a Sanitary Superintendent and under him there are three sanitary inspectors (two of them qualified)—one for Crater, one for Tawahi and Maala and one for Sheikh Othman.

Previously to 1920, the sanitation of the town was in a very unsatisfactory condition. In 1923, when Major (now Lieut.-Colonel) Wightwick, was acting as Chairman of the Settlement, steps were taken seriously to improve the general sanitation of Aden. The sweepers' passages (180 in number) were repaired and re-laid in cement-concrete, and action was taken against house-owners to provide sullage water and soil pipes, to repair privies and receptacles—a sanitary drive which involved the issue of over 2000 statutory notices against house-owners. The shallow soak-pits previously scattered among these passages were demolished and a large soak-pit at the end of each passage was constructed, [illegible] a glazed channel

drain in the centre of the passage, with a catch-pit between the soak-pit and the central drain. The floors of passages were repaired, and they have since been kept regularly in repair, and notices are now regularly issued to house-owners to remedy any sanitary defect observed inside, or outside their houses. Twenty urinals were provided in Crater and Tawahi. The cost of these improvements amounted to over Rs. 30,000. This policy, necessitating the issue of over 4000 additional statutory notices against house owners, has been steadily continued throughout the Chairmanship of Lieut.-Colonel D. S. Johnston, C.I.E., R.E., the present incumbent, and has resulted in a profound improvement in the general sanitation of the town which is now, in many respects, of a standard rarely met with in the East.

Present System of Collection, Removal and Disposal of Night Soil.

The system is the same all over the Aden Settlement. The type of privy in general use in Aden is the "basket" privy, a primitive form of privy possibly imported originally from Bombay. In these privies, the night-soil is received from the privy seat into receptacles, originally perforated (hence the term "basket") to permit of fluid matter escaping into the open drain. This system is bad enough as applied to ground-floor privies, the night-soil from which can at least be regularly removed, but in upper storeys, the connection between the privy seat above and the "basket" below is a wide glazed stone-ware pipe, ten inches or more in diameter, which is not, and cannot be, flushed or cleaned, emits a perpetual stench, and breeds flies in large numbers.

In Aden privies, instead of a "basket," impermeable or iron privy pans are used for privies situated on the ground floor of houses. The use of pans in the place of "baskets" eliminates the serious nuisance arising from fæcal fluid obtaining access to the open channel drain in sweeper passages. In the case of upper floor privies, beneath the wide earthenware soil-pipes, five-gallon iron drums are now used. The diameter of the mouth of these drums is larger than that of the soil-pipes, and hence splashing of night-soil does not readily occur. The privies in thickly populated areas are all made accessible to sweepers' passages. "Pit" privies, self-contained privy-and-cesspool combinations, which used to abound in great numbers prior to 1921 are being abolished and replaced by "basket" privies wherever feasible.

In Crater and Maala there are still some old type back-to-back houses where sweepers' passages do not exist and it is here that pit-privies are still permitted to remain. When such houses are pulled down and re-built by the owners, the allocation of a space for

future sweepers' passages permitting of the normal method of conservancy is insisted on by the Settlement. All the sweepers' passages in Tawahi and in the Crater and some at Maala and Sheikh Othman have now been re-laid in cement and concrete with a central channel drain. In the Crater there are still some sweepers' passages of the old type with four or five shallow soak-pits instead of one large pit at the end A drainage scheme for the Crater is in hand at present and these sweeper passages will be re-modelled as soon as connection with the main drainage is possible.

The night-soil in private and public latrines, collected in the receptacles referred to, is removed by scavengers at night, to night-soil carts specially provided for the purpose on suitable sites in the divisions. The night-soil carts are removed during the early morning hours to the incinerators where the night-soil is mixed on concrete platforms with dry rubbish and furnace oil, and the mixture is incinerated.

The incinerators in use were designed by Lieut.-Colonel Johnston and are remarkably efficient. The refuse and night-soil are so completely burned in them, that nothing remains but ashes, which are removed and deposited on dumping grounds in the neighbourhood of the incinerators.

Disposal of Sullage-Water and Refuse.—In the Crater and Maala the sullage-water from houses passes through a central channel drain in the sweepers' passage into soak-pits. Before it actually enters the soak pit, the water passes through a small catch-pit where silt is retained. This is removed in sullage-water motor lorries four times a week in the Crater and daily by camel carts in Maala. The soak-pits are not touched until they become completely silted up and lose their absorptive power. These soak-pits, not being hermetically sealed, form a very favourite breeding place for flies About 570 soak-pits are de-silted every year in the Fortress.

In Tawahi the drainage system has recently (1931-32) been introduced. The sullage-water instead of passing into soak-pits is now conducted to a special sea out-fall through the main drainage system and all the soak-pits in Tawahi are now abolished. In the Post Office Bay area there are still some soak-pits and some sullage-water receptacles. It is hoped that this area will also be drained when funds are available.

The removal of refuse from domestic and road-side dustbins to the incinerators in the various divisions up to 1921 was carried out mostly by camel-transport, which was found to be most unsatisfactory. Their recent replacement by motor-transport has resulted in considerable reduction in expenditure and much more efficient and rapid transport.

Markets and Slaughter-Houses : Food Inspection.

There are four markets in the Settlement, in Tawahi, Maala, Crater and Sheikh Othman, and they are all kept under close sanitary supervision. They are of a simple but efficient pattern, and the fish and meat stalls are surfaced with glazed tiles. Flies are the principal difficulty : they are dealt with with spraying with "Flit" in the day-time and by flaming after dark.

Slaughtering of animals except for religious purposes is only permitted in slaughter-houses provided by the Settlement, at Tawahi, Maala, Crater and Sheikh Othman. These buildings are of simple construction, but well adapted for their purpose. The sullage from slaughter-houses at Tawahi, Crater and Sheikh Othman is connected with the street sewers. Maala at present having no main drainage, the slaughter-house sullage is disposed of at the sullage-depôt on the Maala foreshore, a method of disposal which is open to many objections, but for which, pending the extension of the main drainage to Maala, there is no suitable alternative. The slaughtering is carried out during the night hours and the meat is transported to the markets in the early morning.

Food Inspection.—Action is taken by the Public Health Department under the Settlement Rules for destroying meat, fish, vegetables or other articles of a perishable nature which are found diseased or unwholesome for human consumption. There all also Settlement Rules dealing with the sale of adulterated milk, ghee and other foods but the application of them is hardly practicable as there are no means of subjecting suspected food-stuffs to analysis other than sending them to Bombay. It is probable that over 90% of the ghee imported into Aden is adulterated, though not necessarily unwholesome, and as the price of pure ghee is three times that of artificial ghee and one is almost indistinguishable from the other except by analytical tests, there is every opportunity for fraud.

The law on the subject is unsatisfactory and it is to be hoped that its provisions relating to the sale of artificial ghee will soon be clarified. The position would be much simpler if artificial ghee were unwholesome and its import could be prohibited. On the contrary, the better qualities of artificial ghee or valuable food-stuffs, popular with the poorer classes, and no rational objection can be taken to their import except (which is usually the case) when they appear in the guise of and at the price of genuine ghee. The position is very similar to that which exists in England with regard to butter and margarine ; the sale of the latter is not prohibited—far from it—but in England the fraudulent substitution of margarine for butter is prevented very strictly and very effectively.

Eating Shops and other Licensed Trades.

Eating Houses, Coffee Shops, Sweet-meat Shops, and Date Stalls.—All these places are registered and the owners licensed. Within the last few years a much higher standard of sanitation has been exacted than was formerly the case, and their present condition is fairly satisfactory.

Ærated Water and Ice Factories.—These are licensed and registered and under constant inspection. A high standard of cleanliness is demanded from ærated water factories, and from their employees, and all employees are inoculated with triple anti-typhoid vaccine every two years.

Offensive Trades.—Licenses are issued to follow the following offensive trades in Aden: curing and drying of skins: tanning; gut-scraping; cleaning, salting and storing of dry fish; and the manufacture of soap. All these trades are carried on at sites remote from inhabited areas The most generally offensive trade is that of curing fish and this trade has now been banished entirely from the Fortress, and has been restricted to an island in the harbour known as Kalfaten Island.

Housing and Building Standards.

The general standard of housing in Aden is fairly good, and as houses are being re-built, the standard is slowly improving The majority of houses are one or two-storeyed and constructed of brick or stone masonry, except in Sheikh Othman, where many houses exist built of sun-baked mud bricks, and faced with mud plaster which is a poor protection against rain storms, fortunately infrequent. The whole of Aden is laid out on a fairly good plan. The main roads are of sufficient width and the cross roads for the most part are not too narrow. Back-to-back houses are few in number, and new houses of this type are not permitted. Between rows of houses at the rear, are strips of open ground five or ten feet in width, called "sweeper passages" and it is into these passages that all privies, washing places and outlets from kitchen sinks are made to open. These passages are made of cement concrete and are constructed with a slight fall sideways, towards a central channel of glazed stone-ware, and lengthwise, towards a street, where the central channel connects through a silt chamber either with the main drainage or failing that, with soak-pits, which are gradually being abolished as main drainage is extended.

In houses being extensively rebuilt or in new constructions, great attention is paid to the light and ventilation of living rooms and their detachment from privy accommodation by spaces or shafts

open to the sky, or by court-yards: the height of houses having a main frontage on to the street is not allowed to be greater than the width of the street, though set-backs are permitted in certain cases. On the whole, therefore, the application of current building bye-laws and the scrutiny to which all building plans are subjected before sanction is given has effected a very marked improvement in the standard of dwelling houses and shops constructed in recent years.

There is one respect, unfortunately, in which no progress has ever been made, that is towards the abolition of the sanitary anachronism known as the "basket-privy" and particularly the upper-storey "basket privy" which is the standard form of privy construction for upper storeys throughout Aden even in the best class of Arab or Indian dwelling houses. This primitive system, which has already been discussed under the heading of "Conservancy" is one of the chief defects in the sanitation of Aden, and until the system is abolished, the sanitation of the town can never be anything but second-rate. Even the advent of piped water supply and of main drainage will not greatly help matters, because the rentable value of most of the houses is so low that the cost of substitution of privies on the water carriage system, which at the best are not very successful in Mohammedan communities, would be disproportionately high. Proposals have been laid before the Settlement Committee to make arrangements in new buildings for the conservancy of the upper storeys by means of exterior sweepers' stair-cases, and for dealing with the privy pans in upper storeys in precisely the same manner as is done in the case of privies on the ground floor. This would do away with the wide soil-pipe down which the excreta drop to the "basket" below, fouling the sides as they fall, and which probably gives rise to the greater part of the fly-nuisance and the consequent menace to health, particularly in the dissemination of intestinal diseases, an important cause of morbidity and mortality in Aden Such, however, is the prevailing Mohamedan sentiment and prejudice, that an external stair-way, although it affords no more access to the upper floors than the privy opening in the lower storey gives to the ground floor, is held, nevertheless, to infringe the privacy of the home and no progress has so far been made. In one block of buildings in Tawahi, known as "Bank Flats", inhabited principally by Europeans, in which there were originally upper storey privies with these objectionable down-pipes, these have been abolished, the inner courtyard, formerly a sweeper's passage, completely remodelled, and the commode system substituted, to the manifest advantage of the numerous tenants.

Infectious Diseases and Disinfection.

During the non-epidemic periods the only local infectious diseases notified are chicken-pox and mumps, which are endemic in

Aden. Cases of chicken-pox and small-pox among lascars are notified from time to time from the shipping, and these cases are admitted to the Infectious Diseases Hospital, Maala. In former years, the transport of these cases from the shipping to a point on the Maala fore-shore nearest to the Infectious Diseases Hospital was by sea in an open hired passenger-boat rowed by boatmen from the ship's berth, not less than two miles away and, if the ship were anchored in the outer harbour, as much as five or six miles away. In rough weather, with an unfavourable wind and tide, this task was almost beyond the powers of the boatmen and inflicted a great deal of unnecessary hardship on the unfortunate patient. This procedure was put a stop to in 1931, when the Settlement provided a motor-ambulance for the transport of infectious cases who, if from the shipping, are now landed at the Abkari Pier which is cleared for the occasion by the police, and transported in comparative comfort to the appropriate infectious diseases hospital. The Port Health Department now possesses a quarantine boat of its own which is used to transport the cases of infectious disease between the ship's berth and the Abkari pier, and the disembarkation of sick in the outer harbour, although a popular measure with ships on the score of economy, has been discontinued by the writer in the interests of the patient. The ambulance car is kept at the Disinfection Station on Maala bye-pass road and its driver is also in charge of the disinfection plant which consists of a modern and very efficient Velox high pressure steam disinfector of the "flash" type recently provided by the Aden Settlement.

Disinfection of houses or living quarters is carried out after general cleansing and destruction of rubbish by submitting all articles of furniture to the direct action of the sun for some hours. The floor, walls, doors and windows are washed and then scrubbed or sprayed with strong disinfectant lotion, and white-washing of the house is insisted on before re-occupation. For rooms in better class houses, where the method is applicable, disinfection is by means of Clayton gas produced in a portable Clayton apparatus. This is very effective and convenient where the room is of such a nature that it can be made reasonably gas-tight with pasted strips of paper. During a plague epidemic, the disinfection is by crude mineral oil for the rougher type of coolies' quarters, and by kerosene oil emulsion for the better class of living accommodation.

Medical Inspection of Schools.

The medical inspection of school-children, though a measure of great importance in western countries is at present likely to be of little value in Aden. The system recently inaugurated in Aden provides for the maintenance of a four-year record of the physical condition and medical defects of children in G[illegible] State-

aided schools. Defects or diseases observed among the scholars by the Medical Officer of Health, who undertakes the inspection, are recorded in a card-index, and are brought to the notice of the parents or guardians of the children who are advised to consult a medical man and obtain suitable treatment for the condition pointed out. The great majority of parents are too backward to realise the importance and value to the child of early treatment of conditions which may otherwise become chronic and threaten his health and earning capacity, and except in a very few instances, no steps have been taken by the persons concerned in the interests of the children. Until this parental co-operation becomes more general, medical inspection of school-children will be an enquiry of chiefly theoretical interest, and is of little service to the public in whose interests it is undertaken. The commoner complaints observed are trachoma, chronic conjunctivitis, defective vision, otorrhœa, and enlarged tonsils.

Training of Dais: Midwifery among the Poorer Classes.

Obstetrics in Aden is a grave and at present an almost insurmountable problem. Though the actual number of midwifery cases admitted to hospital for treatment has been doubled in a year, the number is negligible in relation to the number of registered births, and infant mortality and maternal morbidity are exceedingly high. The local midwives (*dais*) are mostly old and incredibly primitive and unhygienic; they have no training apart from that of tradition, and their principal argument for adhering to their old ways is that infants were born long before obstetrics became a science.

Attempts have been made by Miss Brooks, the lady doctor, to train these *dais*, and after much difficulty it has been possible to get in touch with about twenty of them who attended her classes in an irregular fashion. Eight of these were comparatively efficient and on account of the known quality of their work, were given official *dais*' certificates, issued by the Settlement Committee, and boxes of midwifery equipment, but the difficulty has been that the public have not co-operated by giving preference to certificated *dais*: inferior *dais* have as many clients as their certificated sisters, and the material value of training is therefore not apparent to them.

Apart from lack of public co-operation, any really satisfactory training of *dais* is difficult owing to the scarcity of midwifery cases in hospital. To tackle the problems of blind conservatism, prejudice against Western medicine, and the poor sense of the value of women, necessitates a whole-time appointment, requiring great tact, patience, perseverance and understanding, and much might be accomplished in this direction by the appointment of a suitable Health Visitor.

A scheme for the *initial* training of *dais* presents a promising

field of work. It would be necessary to begin with younger women, probably those whose mothers or relations are traditional *dais* would be the only type available for training. The ideal candidate would interested in the work and not bound by tradition, but it is to be feared that this can only come with the gradual breaking down of existing barriers and the lapse of years.

The building of a new maternity ward is now in progress and will be completed shortly With a lady doctor assisted by health visitors, the future practice of obstetrics in Aden might be organised and placed on a practical basis. Without team-work of this sort, the difficulties are almost insoluble. Team-work would also help to solve the problems of prenatal care and infant welfare. At present a woman is very rarely seen pre-natally, so that there is no chance for the application of preventive measures which are often of such profound importance in obstetrics. The cases that are admitted are nearly all abnormal and are generally brought into hospital in a state of maternal and fœtal exhaustion. There is urgent need for the education of mothers with regard to infant feeding and the rational care of infants, as there is a high infant mortality due almost solely to improper feeding and uncleanliness. It has been proposed to hold a "baby-week" in the near future and it will be interesting to observe the response to the first attempt at this type of work.

Vaccination.

Vaccination has been practised in Aden, as records show, for at least thirty years, and probably for a still longer period. In the early years of the present century primary vaccination was not compulsory and only those were vaccinated who came forward willingly, doubtless a very small number in so backward a community. In 1909 it was proposed to seek powers to apply the Bombay District Vaccination Act of 1892 to Aden. This Act provides for compulsory primary vaccination of infants and children, but for some reason which is not clear from the records, the Act, the application of which to Aden was sanctioned by the Government of Bombay, was not brought into force until six years later. In 1915, the question of vaccination was again raised by the then Political Resident, who appointed a committee to investigate and make recommendations. As a result of their deliberations, the Government of Bombay were again approached and, over a quarter of a century after the Act became law in the Bombay Presidency, it was made applicable to Aden.

The Civil Surgeon, Aden, was made Superintendent of Vaccination and remained in charge of the vaccination department until 1920 when the Aden Settlement Committee appointed an Executive Health Officer to supervise the sanitary and public health work of the Settlement, and the charge of vaccination was taken over by him.

This appointment was not a success and when the terms of his contract had expired, no fresh appointment was made, and the post fell into abeyance for seven years. The charge of vaccination was once more assumed by the Civil Surgeon, Aden.

In 1930, the post of Executive Health Officer (now called Medical Officer of Health) was revived and the present Medical Officer of Health, Dr. Hodivala, was appointed.

From this point onwards, the organisation of the vaccination department was overhauled, the staff increased, and arrangements made for the careful checking of results. The staff of public vaccinators now comprises:—for Steamer Point, Tawahi and the Harbour: the Subordinate Medical Service Officer on harbour duty at the European General Hospital, the Medical Officer in charge, Bai Jerbai Charitable Dispensary, and a female vaccinator; for the Crater, the Subordinate Medical Service Officer in sub-charge of the Civil Hospital, a female vaccinator and a male vaccinator at Barrier Gate post; for Sheikh Othman, the Subordinate Medical Service Officer in charge of Sheikh Othman dispensary, and a female vaccinator.

It is the duty of this staff in normal times, to attend to the primary vaccination of all infants and children and to the vaccination, primary or secondary as the case may be, of all immigrants by sea or land. Immigrants by sea, if arriving by steam-ships, are attended by the Subordinate Medical Service Officer on harbour duty. If arriving in dhows, they are examined by the same officer and if selected for vaccination, are, on arrival at the anchorage for country craft at Maala, sent under escort to Maala dispensary where they are attended to by the Subordinate Medical Service Officer in charge. Immigrants by land, principally groups of Arabs bringing in merchandise from the interior in camel caravans, are inspected at Barrier Gate, near the point where the peninsula narrows to the Isthmus and if unprotected, are vaccinated by the vaccinator on duty there. Supervision of this work is very difficult The opportunities for corruption are obvious and the ultimate results of vaccination can never be checked as Arabs of the caravans have no fixed habitation and are immediately lost sight of and absorbed into the general mass of the population. A system of surprise inspections of all caravan groups soon after they have passed the Barrier Gate is the only available method of checking the work of the vaccinators. As a means of protection against the importation of cases of small-pox, the Barrier Gate inspection acts as a second line of defence in detaining any cases of small-pox which may have escaped first line defence at Sheikh Othman. No inspection can, of course, detect cases in the incubation period of the disease and in the absence of a fully vaccinated urban population such cases are a constant possibility and a constant menace.

The bulk of the primary vaccination in Aden itself is the function of the female vaccinators, who work under the close supervision of the Medical Officer of Health. The results of primary vaccination of infants in the town can be, and are, regularly checked and are the surest indication of the potency of the vaccine lymph used, (which is that issued by the Bombay Presidency Vaccine Institute at Belgaum, and imported weekly in cold storage, by the courtesy of the P. & O. S. N. Company) and of the technique employed Successful results are obtained in 96% or 97% of cases, the remaining 3% or 4% being accounted for by infants who do not respond after three attempts at vaccination, and who may therefore be considered immune to vaccinia and presumably to small-pox.

The recent amendment in 1933 of the Bombay District Vaccination Act of 1892 adapted to the requirements of Aden, together with the recent improvements in the methods of Birth Registration, on which it is largely dependent for its successful operation, have placed the practice of vaccination in Aden in as favourable a position as is possible in the absence of any general compulsory re-vaccination of the adult population, the only administrative measure which is capable of eliminating the risk of epidemic small-pox, but which was excluded, probably wisely in view of the trend of local Mohammedan opinion, from the amendment of the Bombay Vaccination Act in its application to Aden

Anti-Malarial Measures.

These measures consist in a ceaseless campaign against mosquitoes in Aden.

Anti-malarial measures in the Fortress.—These measures are conducted principally against *Stegomyia fasciata* and *Culex fatigans*, for, as mentioned in Section VII, no *anopheles'* breeding places have so far been discovered in the Fortress other than those of *A. subpictus*. As is well known, *Stegomyia fasciata* breeds most commonly in all household collections of water. It breeds freely in fresh or brackish water. The public as a rule keep their water vessels over tins or buckets so as to catch all the water dripping from them. The latter form a favourite breeding place for these mosquitoes, for, although the water in the vessels may be changed frequently, the tins or pails beneath are often neglected.

The *Stegomyia* and *Culex* are also found breeding in private or public wells, either used or disused and in the masonry cisterns in mosques.

To carry out anti-malarial measures, a staff of nine Mosquito Overseers is maintained by the Public Health [illegible] and their

duty consists of house-to-house inspection of domestic collections of water, wells and water carts in their respective beats, in such a way as to cover their whole area in ten days. About 150 houses are inspected in the morning and about 90 houses in the afternoon. By experiment it has been verified that these mosquitoes take about twelve or fourteen days to reach the adult stage from the egg. This fact is taken advantage of, and collections of water of every sort are inspected once in ten days instead of at shorter intervals which would mean the employment of more hands and unnecessary expenditure.

Prior to 1931 the presence of mosquito larvæ on private premises was an offence in Sheikh Othman only; this was not the case in the Fortress. Since then, however, the relevant Aden Settlement rule has been amended and now the breeding of mosquitoes on private premises constitutes an offence throughout the Settlement. This legal power has proved to be very useful in its effects, and the mosquito nuisance in the Fortress has been considerably reduced.

Wells.

In Tawahi there were formerly about 130 shallow wells in courtyards of private houses. There were invariably contaminated with sewage matter and were also found to breed mosquitoes. To remedy this nuisance, the Aden Settlement ordered them all to be filled up, except in a few cases where the wells could be provided with handpumps and hermetically sealed covers. To replace them, eight new public wells of a sanitary pattern have been provided by the same authority in the town. At present there are fourteen wells in Tawahi which are regularly inspected and oiled by the Mosquito Overseers. In Maala there are three wells which are inspected and oiled once a week. In the Crater some of the wells, situated in the Khusaf and the Aidroos valleys are very deep, ranging from one hundred to one hundred and fifty feet. They are rarely used, but they are regularly inspected.

Anti-Malarial measures in Sheikh Othman.

At Sheikh Othman anti-malarial measures are of a more intensive character in view of the danger to be apprehended from the breeding of *Anopheles culifacies.* They consist of:

1. Regular house-to-house inspection of water collections, and inspection and oiling of private wells every week.

2. Inspection and oiling of wells and catch-pits in private and public gardens and those of the distillery and pottery.

my original operations started in

3. Inspection and emptying of garden tanks once a week.

4. Inspection of all mosques at Sheikh Othman, Dar-al-Amir and Halwan The tanks in gardens and mosques are emptied and cleaned every week.

5 Inspection and oiling of surface wells in cucumber gardens at Sheikh Othman and Dar-al-Amir.

6. Regular inspection and oiling of all seepages found breeding mosquitoes in the neighbourhood of the salt-works. Wherever possible, seepages are filled up.

7. Filling up of disused wells wherever possible.

8 Draining when possible of stagnant pools of water in the salt-works area.

These stringent measures have proved to be very effective and malaria has been almost eradicated from Sheikh Othman and the mosquito nuisance has also been largely reduced.

To obtain an accurate idea of the real incidence of malaria, Medical Officers in charge of various hospitals and dispensaries were requested in 1931 to send in fortnightly returns of cases treated as malaria by them, to the Medical Officer of Health, but it was found that practically of all these cases were diagnosed clinically and many of the patients were recent arrivals from the interior. To obviate the fallacy of other fevers being wrongly reported as malaria, the Aden Settlement, at the suggestion of the Civil Administrative Medical Officer, provided the Medical Officer of Health, who is a competent malariologist, with a microscope and staining materials for microscopic examination of the blood of as many cases as possible but particularly of all local patients—that is, persons who have not been out of Sheikh Othman or the Fortress for some time prior to the onset of the fever, and who are suspected to be suffering from malaria. The sending of blood-slides of all such patients has also been arranged for and the Medical Officer of Health examines and reports on them. The findings in such examinations are negative in the majority of cases and the few slides which give positive results are almost invariably from patients who have recently arrived from the interior for treatment, or on business.

Ever since the *anopheles'* breeding places at Sheikh Othman have been brought under effective control, genuinely local cases of proved malaria have been very rare.

This is the measure of the success which has attended anti-malarial measures in Aden. The cost of these measures is not inconsiderable. It amounts to between Rs. 6,000 and Rs. 7,000 p

annum, but it is a small sum reckoned against the value of the work to the community

Anti-Plague Measures.

These measures, which aim principally at the destruction of rats, were instituted since the last plague epidemic in 1928, and are carried out by the Public Health Department of the Aden Settlement at a total annual cost of about Rs. 6,000. The methods employed are trapping, the use of poison baits, and the fumigation of rat-runs with Clayton gas.

(1) *Trapping.*

The traps in use are made in India and are known commercially as the "Improved Elongated Wonder Traps," and are of a pattern recommended by the plague-expert sent by the Government of Bombay during the last epidemic of plague. They are made of thick galvanised iron wire and are about eighteen inches in length. These traps are baited before they are laid in private houses, go-downs, wharves, work-shops, and shops for the supply of food stuffs. Various kinds of baits have been tried, including green vegetables, fruit, cheese, dried fish, bread and ghee, but experience has shown that vegetables and fruit form the most attractive baits. The number of traps used varies from seventy-five to one hundred and twenty-five, according to the size of the district being trapped, and its population.

(2) *Rat Poisons.*

Several poison baits have been tried, namely: barium carbonate, "Rattin," "Rodine" and baits containing arsenic and phosphorus. The most effective (and also the cheapest) poison is barium carbonate, because of the ease with which it can be handled. One pound of barium carbonate mixed with three pounds of fresh *Bajri* flour forms a satisfactory composition, and five or ten-grain pellets are made from this mixture. The use of this poison is generally only resorted to when traps are found to be of no value on rat-infested premises.

(3) *Fumigation with Clayton gas.*

In a few cases Clayton gas has been pumped into rat runs when they have been visible in sweeper passages. It is always difficult to determine where these runs lead to, or what is the effect of the gas, and it is rarely possible to enter houses in search of rat runs. Although no doubt valuable in certain cases, this method is not often practicable.

As a routine, trapping is by far the best method as it is possible to check the results, which is not possible by the other two methods. The rats caught in the Fortress are checked daily at the Settlement office by the Medical Officer of Health and Sanitary Superintendent, and those at Sheikh Othman by the Sanitary Inspector of that area.

As regards numerical results, the number of rats caught in a population of 45,000 is about 40,000 every year The arbitrary ideal aimed at is a number equal to twice the population, but there must be few Eastern towns which can claim that, or whose average exceeds the number of rats caught in Aden, in proportion to the population In the city of Bombay, for example, where, owing to the endemicity of plague, rat-catching is highly organised, the number of rats caught annually per 45,000 of population is about 26,000.

(4) *Rat-proofing of Godowns.*

It is now the policy of the Executive Committee of the Aden Settlement that all new godowns should be constructed on approved rat-proof principles. It has not been found possible to reconstruct old ones

Finally it may be added that the greatly improved standard of sanitation, especially as regards refuse-conservancy and reconstruction of sweeper-passages, may be expected to reduce by a very large amount the opportunities for rats to obtain sustenance and shelter.

CONCLUSION: FUTURE DEVELOPMENTS.

The recent developments of medical relief, of hygiene and of sanitation in the Settlement of Aden have now reached a point beyond which further progress is very largely dependent on the education of public opinion. The more progressive and educated elements of the community are a very small minority in the great mass of the population, which is backward and intolerant of change of any sort. Even the educated and intelligent minority are not free from the trammels of custom and prejudice and it is thus inevitable that those developments of public health work which depend, as so many do depend, on the acquiescence of the general public, cannot make headway in advance of public opinion. Moreover, in a predominantly Mohammedan community, educationally backward and intensely orthodox, all public health measures, however beneficent in their intention, which affect, or threaten to affect, the home, or even the individual, are immediately suspect and the first reactions they evoke are hostile.

Such measures, therefore, as pre-natal care of women, and infant-welfare work conducted by a medical woman, or, indeed, any medical work among women other than of a purely domiciliary character (and even this is sometimes resented), such measures as anti-tuberculosis schemes or anti-venereal schemes, which have grown in Western countries and even in some parts of India, to be so important a part of the public health work, are foredoomed to failure if they are launched in advance of a substantial body of public opinion. This is not a plea for a policy of *laissez faire*; it is a warning against that optimism which is blind to realities.

The education of public opinion in Aden, perhaps more than in other Eastern towns, is an extremely slow and often a very discouraging process, but there can be no doubt that it ought to be pursued. Means are now under consideration by which it is hoped public interest may be aroused, and where there is public interest, there is a possibility, later, of public acquiescence, that essential preliminary to any scheme for improvement of the health of the community which makes any demand on individual effort or on public co-operation. Once this is secured, the way is open for further advance, but even then the watchword of the sanitarian in Aden must always be "*Festina lente.*"

THE END.

APPENDIX I.

STATEMENT SHOWING THE TOTAL AVERAGE ANNUAL EXPENDITURE ON MEDICAL RELIEF IN ADEN, AND THE MANNER OF ITS DISTRIBUTION AMONG CONTRIBUTING BODIES.

GOVERNMENT FUNDS.

Civil Hospital, Aden	Rs. 56,200		
European General Hospital, Aden ...Rs	36,110		
Grant-in-aid Dispensary, Maala	Rs. 1,475		
Infectious Diseases Hospital, Maala . Rs.	3,207		
Grant to Prince of Waies' Aden Nursing Associantion at the European General Hospital Steamer Point ..Rs.	9,600		
Leper Asylum, Sheikh Othman ....Rs.	2,943		
Infectious Diseases Ward for Europeans, at Hedjuff ....Rs.	308		
		Rs.	1,09,843

SETTLEMENT FUNDS

Grant in-aid Dispensary, Maala ....Rs.	1,475		
Infectious Diseases Hospital, Maala ....Rs.	3,207		
Leper Asylum, Sheikh Othman ....Rs.	1,200		
Settlement Dispensary, Sheikh Othman ...Rs.	5,318		
Infectious Diseases Ward for Europeans, at Hedjuff ....Rs.	308		
Grant to Prince of Wales' Aden Nursing Association, Crater Branch, Civil Hospital, Aden ....Rs.	4,000		
Grant to King Edward VII Charitable Dispensary, Crater ....Rs.	3,000		
Grant to Keith Falconer Mission Hospital, Sheikh Othman, for Venereal Disease Clinic ...Rs.	3,000		
Grant to Civil Hospital foi Contageous Diseases Ward ....Rs.	516		
		Rs.	22,024

Carried Over ....Rs. 1,31,867

Brought Over .... Rs. 1,31,867

ADEN PORT TRUST FUNDS.

Grant-in-aid Dispensary, Maala	....Rs.	1,475		
Infectious Diseases Hospital, Maala	...Rs.	3,207		
Infectious Diseases Ward for Europeans, at Hedjuff	....Rs.	308		
Grant to Prince of Wales' Aden Nursing Association, Crater Branch, Civil Hospital, Aden	... Rs.	3,000		
Grant to Prince of Wales' Aden Nursing Association, Steamer Point Branch, European General Hospital, Aden	....Rs.	500		
			Rs.	8,400

PRIVATE FUNDS.

Keith Falconer Mission Hospital, Sheikh Othman	....Rs.	12,000		
and £1000 for salaries of Europeans.	Rs.	13,333		
Bai Jerbai Charitable Dispensary, Tawahi	....Rs.	6,389		
King Edward VII: Charitable Dispensary, Crater	....Rs.	6,126		
			Rs.	37,848
		TOTAL	Rs.	1,78,205

In epidemic years the cost of Medical Relief to Government and Local Bodies is very much heavier. The additional cost due to the epidemic of Plague during the 1928 was Rs. 1,24,000 which was shared equally between Government, Aden Settlement, and the Aden Port Trust. Similarly in the year 1929 there was an additional expenditure of Rs. 49,000 which was due to epidemic of Small-pox, which was shared in the same way.

In previous plague epidemic years the whole cost was borne by the Aden Settlement. The amount thus spent between the years 1900 and 1918 was Rs. 82,700.

APPENDIX II.

STATEMENT SHEWING THE EFFECT OF IMPROVED METHODS OF REGISTRATION ON THE NUMBER OF RECORDED BIRTHS AND ON THE BIRTH-RATE IN THE SETTLEMENT OF ADEN.

Serial No.	Year.	No. of recorded births.	Birth-rate.	Mean Birth-rate.	Deaths.	Natural increase.
1	1922	1005	22.84	18.91 (1922–1930)	1152	—147
2	1923	884	20.09		1048	—164
3	1924	896	20.36		1203	—307
4	1925	758	17.22		1321	—563
5	1926	752	17.09		1265	—513
6	1927	697	15.84		1116	—419
7	1928	648	14.72		2937†	—1,289
8	1929	814	18.50		1876†	—1,062
9	1930	1037	23.56		1612	—575
10	1931*	1410	30.65	33.13 (1931–1933)	1345	+65
11	1932*	1502	32.65		1084	+418
12	1933*	1660	36.09		1230	+430

*New Registration methods in operation †Epidemic years (Plague and Small-pox).

APPENDIX III.

STATEMENT SHOWING THE PRINCIPAL CAUSES OF MORTALITY IN THE SETTLEMENT OF ADEN.

(Mean of the four years 1930–1933.)

Serial No.	Causes of Death	Mean Annual No. of Deaths.
1	Diarrhœa, Dysentery and Gastro-enteritis.	276
2	Pneumonia ..	166
3	Phthisis ...	147
4	Premature and Still Births	128
5	Respiratory Diseases other than Pneumonia and Phthisis	106
6	Unclassified Fevers ..	77
7	Malaria	35
8	Septicæmia and Cellulitis .	25
9	Enteric Fever ...	20
10	Cardiac failure .	18
11	Cirrhosis of the Liver	15

Mean Death-Rate for the period=29.04 per 1000 of the population.